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# THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY
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Vol. XLV DECEMBER, 1933 No. 4

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## WAYS OF THE BLACK SKIMMER

BY IVAN R. TOMKINS

Nearly everyone within the range of the Black Skimmer (*Rynchops nigra nigra*) is familiar with it by one name or other, and many of these names refer to its habit of skimming for food. Champlain, in 1605[1], noticed this species, and described it unmistakably. Since then many others have added various facts, but since it is not possible to tell everything about any one species, this account may perhaps add a little or present old information in a different light.

The place of the observations recorded here is about the entrance of the Savannah River, and the nesting places are on Oysterbed Island, in Georgia, and the Long Island Fill, mostly in South Carolina. The elevation runs up to twenty-two feet above low water, but a tidal rise of six to nine feet makes much of this area untenable for skimmer nests. The colony sites of one year are often abandoned the next, due to the encroaching grass or shrubs, as the skimmers, with their long wings and light bodies do not maneuver well around vegetation. The dredges that pump sand from the neighboring river, furnish new and clear nesting grounds every year or so.

My acquaintance with nesting skimmers extends somewhat casually over portions of ten summers, but the best chance for observation came in 1932, when my floating home was near the Long Island Fill from June 29 till fall. At one time our pipeline went directly through a colony, but with care in laying the line very little damage resulted, and that little arose more from the shyness of certain individuals, than from actual physical disturbance.

No hawks remain in this section during the summer, except a red-tail on Turtle Island, about three miles to the northward, and the Fish Crows that damage the earlier nesting birds, are separated into pairs, and stay close to their own nests through June and July, and so are not much of a menace. But the sudden rain squalls of summer are the worst destroyers of the skimmer nests. A half hour of hard rain will wash away the easily eroded sand, and bury and scatter eggs

everywhere. Some female skimmer with a good sense of location may scratch out the sand from around her clutch, if they are not scattered, but most of the parents will leave the place, and lay another set some days later. When the first hard gusts of wind before the storm blow tiny grains of sand over the grounds, the nesting birds rise like one into the air, there to circle madly for a few minutes, then settle again on the eggs if the wind is not too strong. So the nesting time is extended from the last of May until almost September.

Some earlier writers have said that these birds make their nests by squatting on the sand, turning round, and boring with their bodies.[2] This does not seem like a careful statement from anyone who has handled many breeding birds, and seen the unbroken and immaculate feathers of the breast. I have seen many birds settle into the nest hollows even after incubation is well advanced, and kick backward to remove sand, then sink into the hollow to see how well it fitted. The skimmer usually faces into the wind, and its folded wings and tail make a wind-vane of it, and perhaps the roundness of the nest is due to the fact that the wind goes around the compass at least once every twenty-four hours, on most summer days. The nest hollows always show the scratchings of tiny feet unless a breeze has smoothed out the marks, and not the revolutions of an animated feather duster.

My blind, made of a couple of crocus bags, was in the middle of a small colony, and I prepared a few gauze swabs smeared with prussian blue. These were placed in certain nests, and I retired into the blind. Two birds went at once to their nests, resting against the swabs, and marking their breasts with blue smears. But one was too shy, and would not go into the nest. Another tugged and pulled at the swab, trying to remove it. At each tug her mate would swoop down, and together they zoomed fifty feet into the air, to return almost at once. It was evident he believed that she was about to harm the eggs. In a few minutes I removed the swabs, put numbered sticks by the nests, and then had a chance to register the comings and goings of each incubating bird so marked. Though I was in the blind on several successive days, at no time did any other than the marked birds return to these nests, and as one nest had eggs laid in it during these days, it seems that the females must do all the incubating. One day after scaring them all off the nests, I swapped two sets of eggs (four in one case, five in the other) from birds that were differently marked. In less than five minutes after going into the blind, both birds returned and at once settled on their nests—and their neighbor's eggs. In the colony was one Least Tern, and the bird did not return so quickly to

FIG. 10. 1. Oysterbed Island, in June. 2. A nest with five eggs. 3. The chick is about four days old. 4. The hiding pose. 5 and 6. Nearly ready to fly.

the nest as did the skimmers, and always had to run a gauntlet of lunges and jabs from the birds already settled on the nests. They even did not seem to trust their own kind too close to the nesting territory.

The young birds hatched a day or so apart, showing that incubation started when the first egg was laid, as indeed must have been necessary, with that hot sun beating down on the sand. The old birds fed the young directly so far as I could see, but the adults, like the hawks, owls, and the gulls, regurgitate the scales and indigestible matter from their own food,[3] and the young chicks picking at it might have easily appeared like being fed by regurgitation. Often a young bird too small to run from the nest would have the tail of a small fish sticking out of its mouth. And the adults are to be seen coming to the colony with fish or shrimp crosswise in the bill soon after the first eggs are laid.

The common shrimp, *Penaeus*, is often found on the ground near the nests where it has mummified after being refused or dropped. Small mullet and menhaden are also brought in, and once I found an eight inch long garfish discarded among the nests. If a young bird but little over four inches long, tried to swallow head first this garfish, with a head about one-third its length, it might be hard to get much nourishment from it.

When the birds are about a week old they leave the nest to run about, and down below high watermark where the sand is moist and cool, each scratches a hollow just right to lie in. Their feet are nearly as large as those of the parents, and of several hundred which I banded, none showed any discomfort later from too loose bands. It became very common to catch a youngster and find a band placed three weeks before. At about five weeks old they begin to fly, to develop the longer, horny sheath to the lower bill, and then they begin to show the reddish color on the bill, and to display a voice, as plainly juvenile as is that of a young crow. In May, 1933, one of those swooping over a proposed nesting site had a trace of immaturity in its voice.

No one seems to have recorded the fact that some skimmers remain in winter plumage, with a white band or spot on the hind neck, throughout the summer, and do not frequent the breeding grounds. Presumably these are non-breeders.

The "skimming" way of feeding is the only one I have ever observed, and though many hours have been spent watching them, I have never seen one actually catch a fish that way. I have seen a piece of drift sedge the size of a lead pencil carried many feet into the air,

and dropped. And when the tide is low, and the area of shallow water over the mudflats distant and small, there has been a regular procession of skimmers going out and others returning with food. The skimming activities are greater at dusk and at low tide, while the hoarse notes can be heard all night as they come and go overhead. One night in November we went back to a small pond, teeming with mummichogs, to find a lone skimmer swinging across and back in the moonlight. When skimming the wing beat is quickened and shortened, with the motion mostly in the "hand" of the wing, and the long "forearm" taking small part in the beat, except to keep the wing high above the water. The bill opening is increased through the elastic hinge of the forehead, which allows the lower bill to be carried more nearly parallel to the water surface.

During late September, before there was any great liklihood of migrants from other breeding grounds, and after all the young were awing, I counted the young and old in several flocks that were resting on the sandbars, and found 156 young to 586 adults, or an increase of 26.6 per cent. This means of course only that this was a probable percentage of increase on the breeding birds up to the end of the season, in what seemed to me a normal year. The yearly increase, or rather replacement, would be affected by the mortality of young and of adults during the rest of the year, and by the proportion of non-breeders that then were absent from the flocks. Possibly these last may be found to be birds too immature for nesting in the first or second summer, a common thing with the larger gulls. But that is not proven, and may be one of the things that banding may yet assist in ascertaining.

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U. S. Dredge Morgan,
Savannah, Ga.

# A TEN-YEAR-OLD CARDINAL

BY ALBERT F. GANIER

Mortality among the smaller birds is surprisingly large due to the hazards of a life without shelter from the elements and exposure to natural enemies. Some conception of how short lived our birds really are may be had when one stops to consider that through the years most of our common birds neither increase nor decrease, yet the smaller species bring forth two broods (average) a season, in all, about eight young. If all of these birds returned the following spring there would be ten birds where there were two the year before, and on the third spring there would be fifty. If, as it usually happens, on the second spring there survives only one pair, it means that four pairs have perished and that the average life of these birds has been less than three months. Settlement of new territory and widening of range accounts for only a small percentage of this apparent loss. When a bird has reached the full maturity of its first mating season it has become worldly wise to the extent that its life expectancy has greatly increased and it is probable that a bird which has celebrated its second birthday may look forward to two more. If it lives on beyond that time it may be classed as "lucky" or having had a degree of protection and food supply far better than the average.

During the winters of 1923-24-25, the writer banded at his home, forty-six adult Cardinals (*Richmondena c. cardinalis*), twenty-six of which were males. On one of these males, on February 12, 1924, he placed band No. 73082. Between that date and spring, nine more Cardinals were banded, three of which repeated, but No. 73082 was not handled again. During the next winter twenty-three more of this species were banded and there were a number of repeats, but again No. 73082 was not among them. A real estate development about my home in 1926, effected such a cleanup that few birds remained or returned to visit my premises, so I gave my traps to others for use at other points. During the years which followed, however, I maintained each winter, a feeding shelf which was patronized by a Mockingbird, a pair and sometimes a flock of Cardinals, together with other transient species. In 1930 and again in 1931 I noted that the male Cardinal of the pair wore a band but several attempts to trap him failed. Always, winter and summer, there was a pair of Cardinals about my grounds, and with ample shrubbery as well as fruited hackberry trees, water, and a feeding shelf, they seemed to be entirely at home. During warm days in late winter the male would herald the approaching

spring with his loud, clear whistle from the top of one of the trees in the yard.

In January, 1933, birds had begun to increase in the neighborhood and Cardinals visited my "cafeteria" several times each day, usually in a flock of eight or ten males and females. More often ,they could be seen on the lawn, sedately hulling the fallen hackberries which they found in the grass. I decided to resume trapping on a limited scale and during the first three months, banded nineteen Cardinals, fourteen of which were males. A surprising thing to me was that these birds rarely repeated and instead of being visited by the same flock each day, it developed that they were roving flocks, very few of which returned. On January 29, 1933, I placed band No. B227540 on a male and with a hurried glance, I released him as being of no particular interest. During the balance of the winter I failed to find him among the seven repeats. In late October I set a drop trap outside my bedroom window, which I could watch as I dressed, and on the 28th, I pulled the string as my pair of Cardinals entered it together. The female was found to have been banded the preceding February and the male was No. B227540. Looking him over, I found that he was in good condition except that some of his new neck feathers had not grown out to full length and the outer tail feathers were as yet only about half the length of those at the center. He appeared unusually quiet and made no particular effort to bite or get away. As I examined him I was much surprised to find that on his left (wrong) leg he wore a snug and well worn band. Securing the assistance of my son I carefully removed this and released the bird. The number was not among those I had placed early in the year so I sought out my old record book and was soon elated to find that the band, No. 73082, was the one placed on this bird February 12, 1924. The figures are clearly visible although it had been worn nearly ten years; the band has been sent to the U. S. Biological Survey to keep in its archives. Since the bird was at least six months old when first banded, here is an authentic instance of a Cardinal having attained a life of more than ten years.

I have reason to believe that this male has used my yard as a home during his entire lifetime. A pair of Cardinals build at least three nests each year in the shrubbery about the place. The first of these nests each season for six years past has been built in an Amoor River privet which grows against the south window of a bedroom. In late March the male leads the female into this early leafing shrub and, although she inspects other sites, this one is chosen, even to the same crotch. Both birds bring in material and when the female is shaping

the nest, the male "hands" her his material and she weaves it into the structure. This first nest is usually completed from ten to twenty days before the first egg is laid. It was noted this spring, through the glass of the window two feet away, that both birds wore bands. The young left this nest successfully, as they usually do, and shortly afterwards a second brood was brought forth from a nest in a trellis. Three more nests were built in an effort to raise a third brood but grackles robbed each of them.

On October 12 I noted a male banded Cardinal at my feeding shelf in such poor plumage that I at first took him to be a young one. The bird was molting. A moment later, another male flew beside him, all spick and span with full new plumage. The latter immediately began to quiver his wings and beg for food which the molting bird proceeded to pick up and place in his mouth. This procedure was noted again a few days later and serves to show how the parental devotion persists long after the young are able to shift for themselves. I feel certain that the banded bird was No. 73082.

This pair of Cardinals furnished interesting data in June, 1932, on the ability of diurnal birds to see at night. On the night in question the moon was nearly full but the sky was overcast so that its light was much subdued. At 9:15 P. M., I was walking along the side of my tall privet hedge and, noting some projecting shoots, proceeded to cut them off with my knife. A bird fluttered out above my head and I then perceived its nest in silhouette a few inches from where my hand had been. The bird had flown into a large hackberry tree about thirty feet away. I immediately withdrew and from hiding watched for thirty minutes to see if the bird would fly back. There was certainly no direct return during that period. I went into the house and two hours later, with shaded flashlight, carefully approached and was gratified to see that the bird, a female Cardinal, was again on the nest.

NASHVILLE, TENN.

# EXPERIMENTS ON THE DIGESTION OF FOOD BY BIRDS*

BY JAMES STEVENSON

## Introduction

Food is a factor of considerable importance in bird life because of the high rate of metabolism maintained in the body and the consequent rapid digestion of food required to maintain such a rate. This high rate of metabolism is indicated by the high body temperature, great rapidity of heart beat and respiration, and ceaseless activity.

Few birds are confined to one particular type of food and many are omnivorous. The quantity of food available, as well as the quality, is of primary importance in bird life. Many data, compiled by the United States Biological Survey under the direction of W. L. McAtee, indicate that birds, within limits, feed on the kind of food most readily available. Much information has been collected in the last fifty years on the kind of food which birds eat, but the amount which is consumed is less often considered. The Biological Survey and other investigators have spent much time in determining the percentage of insects, seeds, and other types of food that are in the stomach at any one time. Most work of this sort is undertaken to determine the economic importance of birds to man. The study, here reported, takes a different point of view in considering the rôle of food in the physiology and activity of the birds themselves. This paper is intended to serve only as an introduction to the general problem. The results are of a preliminary nature but may be suggestive for further research.

## Time of Feeding and Holding Capacity of the Stomach

At the Baldwin Bird Research Laboratory, Gates Mills, Ohio, where systematic trapping is carried on each year, it has been found that passerine birds spend a large proportion of the day in feeding. Opening the stomachs of over 200 birds, taken at all seasons of the year, has revealed less than ten that were empty. These birds were taken at all hours of the day but not at night, and show that our small birds apparently do not fill their crops and stomachs and then wait until they are empty before refilling them, but eat from time to time. A study was made of the weight of stomach contents in a few species, and Table I gives these data separately for adults and juvenals.

In the English Sparrow (*Passer d. domesticus*) the lower end of the oesophagus was found in a few individuals to be enlarged in the

*Contribution from the Baldwin Bird Research Laboratory (No. 27) and the Biological Laboratory, Western Reserve University, Cleveland, Ohio.

TABLE I. Weight of Stomach Contents in Some Passerine Birds.

| Species | Age | Number of Records | Average Weight of Bird | Average Weight of Stomach Contents | Weight of Contents Divided by Body Weight | Maximum Weight of Stomach Contents |
|---|---|---|---|---|---|---|
| | | | Grams | Grams | | Grams |
| Song Sparrow | Adult | 5 | 20.3 | 0.261 | 0.0128 | 0.390 |
| Song Sparrow | Juvenal | 6 | 18.9 | 0.335 | 0.0177 | 0.730 |
| English Sparrow | Adult | 6 | 27.4 | 0.269 | 0.0098 | 0.387 |
| English Sparrow | Juvenal | 24 | 26.0 | 0.326 | 0.0125 | 0.650 |
| Starling | Adult | 4 | 80.8 | 1.490 | 0 0185 | 1.880 |
| Starling | Juvenal | 2 | 79.9 | 2.290 | 0.0287 | 2.820 |
| Northern White-breasted Nuthatch | Adult | 10 | 20.7 | 0.311 | 0.0150 | 0.550 |

form of a crop. In adults, the weight of the crop contents averaged 0.228 grams, and in the juvenals, 0.277 grams. The food of English Sparrows and Song Sparrows (*Melospiza melodia*) consisted almost entirely of grain, and that of the Starlings (*Sturnus v. vulgaris*) and Northern White-breasted Nuthatches (*Sitta c. carolinensis*) was composed of insects.

In addition to showing the amount of food contained in the stomach at one time, Table I indicates also that juvenal birds out of the nest may carry more food in their stomachs than do the adults, although the number of records are few. In addition to the data in Table I, the following is of interest in this connection. Five nestling Starlings taken at ages ranging from three to sixteen days had an average full stomach content of 2.85 grams, which is to be compared with 1.49 grams in four adults whose stomachs were full. The three-day nestling had a stomach content weighing 2.86 grams. Nestling birds may require relatively more food than adults, as this is used in their rapid growth.

A few measurements on the size of the stomach (length and width) in adult and nestling birds taken after food had been removed indicate further what may prove to be the greater food-carrying capacity

TABLE II. Size of Stomach in Adult and Nestling Birds.

| Species | Age | No. of Records | Average Length | Average Width | Range in Length | Range in Width |
|---|---|---|---|---|---|---|
| | | | Centimeters | Centimeters | Centimeters | Centimeters |
| Eastern House Wren | Adult | 4 | 1.0 | 0.9 | 0.9-1.1 | 0.8-1.0 |
| Eastern House Wren | Nestling | 4 | 1.2 | 1.0 | 1.1-1.3 | 0.9-1.1 |
| English Sparrow | Adult | 2 | 1.4 | 1.2 | 1.3-1.5 | 1.2-1.3 |
| English Sparrow | Nestling | 8 | 1.7 | 1.5 | 1.3-2.1 | 1.2-1.8 |
| Starling | Adult | 3 | 2.0 | 1.6 | 1.9-2.2 | 1.5-1.6 |
| Starling | Nestling | 6 | 2.2 | 1.8 | 2.0-2.4 | 1 5-2.4 |

of young birds over adults (Table II). It is desirable that more material on this subject be obtained, as the present data are scanty.

### Length of Small Intestine

A study was made of the length of the small intestine in birds collected at the laboratory. Most of these were passerine birds, but a few individuals of other orders were obtained. An attempt was made to distinguish possible differences in the length of intestine in male and female adults and in nestling birds. It was desired to correlate the length of intestine with the length of time for food to pass through the body, with the amount of food consumed, and with the type of food eaten. Of course, the length of intestine is not the actual area of absorption in the intestines. Future studies should take in the width of intestine as well as the length to give more dependable figures on this area. The length of the small intestine was taken to be the distance from stomach to caeca. The large intestine is short and was not included in this study. Gadow and Selenka (1891) have several measurements on the length of the small intestine in their monographic work.

*Variation with Sex*—The small intestine shows a relationship to sex which will be considered here (Table III). More records were obtained on the Eastern House Wren (*Troglodytes a. aedon*), Starling, and English Sparrow than on any other species. The small intestine of the females of the Eastern House Wren and English Sparrow were found to be 17.9% and 13.0% longer, respectively, in "actual" length than the small intestines of the males. Starling figures favor the males slightly (0.67%). To obtain a better comparison, since the size of the body often varies with sex, the length of the intestine in centimeters was divided by the weight of the body in grams, which gives a measure of the percentage length of the small intestine in terms of the body size (weight). In all three cases, including that of the Starling, the greater proportional length of intestine then favors the female. In the male birds of twenty species studied, the average small intestinal measurement in proportion to body weight averaged 0.762. In females this proportion averaged 0.929, showing that a longer intestine for the female sex is, with a few exceptions, rather generally true in Passeriformes. Riddle and Flemion (1928) found from data on 1,157 ring doves that female doves possessed longer small intestines (from 5% to 10%) than did the males.

*Variation with Age*—The rate of growth of the small intestine was determined in nestling House Wrens. These data are given in Table IV.

TABLE III. Sex Difference in Length of Small Intestines in Birds.

| Species | MALES | | | | FEMALES | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of Birds | Average Length of Intestine | Average Body Weight | Length Divided by Weight | Number of Birds | Average Length of Intestine | Average Body Weight | Length Divided by Weight |
| | | Centimeters | Grams | | | Centimeters | Grams | |
| Eastern House Wren | 12 | 10.3 | 10.7 | .962 | 4 | 12.15 | 12.2 | .966 |
| Starling | 16 | 29.5 | 80.4 | .367 | 10 | 29.3 | 78.7 | .372 |
| English Sparrow | 11 | 17.15 | 26.3 | .652 | 14 | 19.5 | 27.1 | .723 |
| Eastern Cowbird | 1 | 13.9 | 46.7 | .297 | 2 | 17.5 | 41.8 | .418 |
| Red-eyed Towhee | 5 | 21.34 | 41.6 | .513 | 3 | 22.36 | 39.8 | .562 |
| Eastern Purple Finch | 7 | 36.1 | 25.3 | 1.425 | 1 | 33.0 | 25.4 | 1.299 |
| Slate-colored Junco | 2 | 17.8 | 21.2 | .840 | 1 | 19.8 | 21.3 | .930 |
| Eastern Field Sparrow | 1 | 14.0 | 13.7 | 1.022 | 1 | 12.4 | 12.7 | .976 |
| Song Sparrow | 8 | 17.8 | 20.6 | .856 | 1 | 17.6 | 18.0 | .980 |
| Eastern Chipping Sparrow | 5 | 12.5 | 11.5 | 1.087 | 3 | 13.1 | 11.7 | 1.199 |
| Red-eyed Vireo | 2 | 14.1 | 16.0 | .881 | 4 | 16.2 | 16.7 | .970 |
| Ovenbird | 3 | 15.9 | 19.2 | .828 | 2 | 17.8 | 19.3 | .922 |
| Redstart | 4 | 11.3 | 8.0 | 1.295 | 1 | 9.5 | 7.2 | 1.319 |
| Bronzed Grackle | 3 | 31.3 | 110.4 | .283 | 1 | 25.0 | 98.9 | .253 |
| Blackburnian Warbler | 1 | 10.0 | 11.1 | .901 | 1 | 10.0 | 9.5 | 1.053 |
| Eastern Catbird | 2 | 16.8 | 31.1 | .542 | 1 | 21.1 | 38.1 | .554 |
| Black-capped Chickadee | 7 | 12.3 | 12.2 | 1.008 | 3 | 13.2 | 10.6 | 1.242 |
| Northern White-breasted Nuthatch | 6 | 15.2 | 21.0 | .724 | 4 | 16.4 | 20.2 | .724 |
| Eastern Robin | 7 | 24.2 | 82.3 | .293 | 2 | 28.7 | 77.8 | .369 |
| Eastern Hermit Thrush | 1 | 15.5 | 32.7 | .474 | 1 | 16.8 | 31.4 | .535 |
| TOTAL, 20 species | 104 records | | | Average .762 | 60 records | | | Average .929 |

TABLE IV. Increase of Intestinal Length in Nestling House Wrens.

| Age | Number of Records | Average Length of Intestine | Average Body Weight | Length of Intestine Divided by Body Weight |
|---|---|---|---|---|
| Days | | Centimeters | Grams | |
| 1 | 2 | 4.2 | 1.5 | 2.80 |
| 2 | 3 | 6.5 | 2.7 | 2.41 |
| 3 | 3 | 6.5 | 3.3 | 1.97 |
| 4 | 2 | 7.3 | 4.1 | 1.78 |
| 5 | 6 | 10.4 | 6.3 | 1.65 |
| 6 | 7 | 10.6 | 6.7 | 1.58 |
| 7 | 4 | 11.0 | 7.1 | 1.55 |
| 8 | 9 | 11.6 | 8.2 | 1.41 |
| 9 | 3 | 11.6 | 8.3 | 1.40 |
| 10 | 3 | 12.2 | 9.3 | 1.31 |
| 11 | 3 | 12.5 | 9.5 | 1.31 |
| 12 | 2 | 11.8 | 9.6 | 1.23 |
| 13 | 2 | 11.7 | 10.3 | 1.13 |
| 14 | 2 | 11.6 | 10.6 | 1.09 |
| 15 | 3 | 11.7 | 10.6 | 1.10 |

From Table IV, it is evident that growth in the length of the small intestine is very rapid up to the age of eight days, after which it becomes slower. The maximum length is attained at eleven days, after which there appears to be some actual shrinkage to the length characteristic of the adult (Table IV). The rate of growth of the small intestine in proportion to body weight is shown in the last column. There is a gradual decrease in this proportion with increasing age until the birds become adult. In eight nestling Starlings, the length of the small intestine in proportion to body weight was found to be 0.411, while in twenty-six adults it averaged 0.369; in fourteen nestling English Sparrows this proportion was 0.985, while in twenty-five adults it averaged 0.682. All these data indicate a relatively, if not actually, longer small intestine in nestling birds than in adults.

*Variation with Type of Food Consumed*—Different species of birds feed on somewhat different types of food. Some correlation is possible between type of food consumed and length of intestine. In Table V this correlation is brought out by comparing the length of the intestine with the total length of the body. The length of body was considered to be the length from shoulder to coccyx and was measured in the manner prescribed by Baldwin, Oberholser, and Worley (1931, p. 62).

The length of the small intestine in the species studied is relatively uniform among insectivorous and omnivorous feeders. In birds feeding upon mammals and birds it appears to be somewhat longer. In one species feeding largely on fish and amphibians, it was found to

TABLE V. Relation between Type of Food Consumed and Length of Intestine in Different Species of Birds.

| Species | Predominant Type of Food Consumed | Number of Records | Average Length of Small Intestine | Total Length of Body | Length of Intestine Divided by Body Length |
|---|---|---|---|---|---|
| | | | Centimeters | Centimeters | |
| Eastern House Wren | Insects | 11 | 10.8 | 3.6 | 3.0 |
| Black-capped Chickadee | Insects | 6 | 13.1 | 3.6 | 3.6 |
| Northern Downy Woodpecker | Insects | 4 | 20.4 | 5.7 | 3.6 |
| Eastern Hairy Woodpecker | Insects | 3 | 24.4 | 7.3 | 3.3 |
| Song Sparrow | Omnivorous | 6 | 18.3 | 4.6 | 4.0 |
| English Sparrow | Omnivorous | 16 | 18.8 | 5.3 | 3.6 |
| Eastern Chipping Sparrow | Omnivorous | 5 | 13.5 | 3.8 | 3.6 |
| Red-eyed Towhee | Omnivorous | 5 | 21.2 | 5.9 | 3.6 |
| Eastern Robin | Omnivorous | 4 | 24.6 | 7.6 | 3.2 |
| Starling | Omnivorous | 21 | 29.4 | 8.1 | 3.6 |
| Northern White-breasted Nuthatch | Omnivorous | 6 | 14.7 | 4.6 | 3.2 |
| Broad-winged Hawk | Mammals, Birds, etc. | 2 | 89.0 | 13.8 | 6.0 |
| Cooper's Hawk | Mammals, Birds, etc. | 3 | 54.7 | 13.3 | 4.1 |
| Eastern Least Bittern | Fish, Amphibians, etc. | 2 | 69.6 | 8.2 | 8.5 |

be very much longer. A nine-day-old Bald Eagle (*Haliaeetus l. alascanus*[1]) that had been hatched at Western Reserve University possessed an intestine 147 centimeters long, or twenty-two and one-half times its body length.

An explanation of the differences discovered in intestinal length is not attempted in this paper. A long intestine might work to advantage if it furnishes a greater area for food absorption. Allen (1925, p. 68) says, "The digestion of birds is very rapid, and this is perhaps due in part to the great length of their small intestine." On this basis a longer intestine in adult females and in nestlings may indicate more rapid or efficient absorption than in adult males.

[1]The author's manuscript followed the nomenclature of Peters' "Check-List of the Birds of the World" (Vol. I, p. 258) in designating this subspecies as *washingtoniensis*. The editor has changed it to *alascanus* in conformity with the A. O. U. Check-List, which we accept as authority. If Peters' work were complete so that it might be followed consistently, our practice might be otherwise. —Editor.

## Rate of Food Passage through Digestive Tract

A study was made of the rate of food passage through the digestive tract of birds. Birds were placed in cages outside a laboratory window and left without food for at least two hours. Screens made of black cloth containing a small peep hole were placed between the birds and the observer so that the birds might be watched without being disturbed. Finely cracked corn, stained with neutral red, gentian violet, or Janus green, was given the birds in order to note the first appearance of waste particles of this stained food in the excrement. In these cases no difference in time was noted between birds fed unstained food and those given stained grain. A method similar to this was used by Kaupp and Ivey (1923) on chickens. Miller (1931) found that elderberries passed through the digestive tract of shrikes in about three hours.

Table VI. Rate of Food Passage through the Digestive Tract of Passerine Birds.

| Species | Age | Number of Records | Average Time until First Colored Excrement | Shortest Time Recorded |
|---|---|---|---|---|
| **Birds Starved Two or More Hours, then Fed Stained Cracked Corn** | | | | |
| Song Sparrow | Juvenal | 38 | 1 hour 34 minutes | 58 minutes |
| Song Sparrow | Adult | 4 | 1 hour 42 minutes | 1 hour 22 minutes |
| Eastern Chipping Sparrow | Juvenal | 5 | 1 hour 18 minutes | 1 hour |
| Eastern Chipping Sparrow | Adult | 2 | 1 hour 2 minutes | |
| Eastern Field Sparrow | Juvenal | 2 | 1 hour 37 minutes | 1 hour 14 minutes |
| Eastern Field Sparrow | Adult | 2 | 1 hour 41 minutes | |
| English Sparrow | Juvenal | 1 | 1 hour 25 minutes | |
| Red-eyed Towhee | Juvenal | 3 | 1 hour 32 minutes | 1 hour 20 minutes |
| Five species Fringillidae | | 57 | 1 hour 32 minutes | |
| **Birds Starved Two or More Hours, then Fed on Fruit (Raspberries)** | | | | |
| Cedar Waxwing | Juvenal | 2 | 1 hour 40 minutes | |
| **Birds Starved Two or More Hours, then Fed on Insects (Beetle and Moth Larvae—Mealworms)** | | | | |
| Scarlet Tanager | Adult | 6 | 1 hour 25 minutes | |
| **Average Length of Time between Last Stained Food Eaten and Last Colored Excrement Voided** | | | | |
| Song Sparrow | | 11 | 2 hours 14 minutes | |
| Eastern Field Sparrow | | 3 | 2 hours 30 minutes | |
| **Birds not Starved Previously (Other Food in Digestive Tract)** | | | | |
| Song Sparrow | Juvenal | 5 | 2 hours 33 minutes | |

The average time required for the first stained food to pass through the digestive tract in previously starved birds (Fringillidae) was 1 hour and 32 minutes (Table VI). In instances where birds

were not starved previously there was a delay of approximately an hour in the appearance of the first colored excrement. This agrees with the delay of nearly an hour in the interval between last food eaten and last excrement voided. There is evidently a delay, probably in the stomach, in the passage of food after some has already been taken into the alimentary system. It may be noticed that the rate of passage in birds fed insects, fruit, or grain, is practically the same. With such rapid assimilation of food material, birds must keep searching actively for nourishment.

### Amount of Food Consumed Daily

The number of meals per day, or times that the stomach is filled daily, has been estimated by various ornithologists. Allen (1914) calculated that adult birds eat eight full meals a day, and Bailey (1905) thought that insectivorous birds filled their stomachs five or six times daily. Rörig (1905) determined amount of food in dry weight consumed daily by certain European birds. This varied in different species from 8-13.4 per cent of the body weight in winter to 11.9-19.5 per cent in summer. Taber (1928) has deduced that a dove will consume from 11 to 20 per cent of its weight daily in grain or weed seeds. Bryant (1914) concluded that meadowlarks could completely digest a meal in four hours and that they took only three meals a day. He believed that grain took longer to digest than insects and that the amount of grain found in a stomach would equal nearly one-half the daily requirement. Miller (1931) working on captive shrikes found that they might eat between fifteen and twenty grams of beefsteak or mice in one day.

If the time required to empty completely the stomach and intestines in a Song Sparrow is 2 hours 14 minutes, and the average daily duration of total possible sunlight during June, July, and August is 14 hours 35 minutes at Cleveland, Ohio, then this species must consume the equivalent of six and one-half meals per day. Since birds may be active before sunrise and after sunset (Shaver and Walker, 1931), another meal may be consumed, which is not fully digested until after dark, to make a total of seven and one-half meals per day. If the average weight of a normal stomach full of food in the song sparrow is 0.261 grams, the total food consumed during the day will equal 1.957 grams, or 9.6 per cent of the body weight of the adult. Experiments on a Scarlet Tanager fed meal worms, the larvae of moths and beetles, showed that the bird would eat an amount equivalent to 32.1 per cent to 40.8 per cent of its body weight daily.

### Percentage of Food Digested

Most of the food given sparrows used in these experiments consisted of "chick feed" or finely cracked corn. In order to determine the percentage digested (Table VII) a specific amount of food was given in each case and the amount eaten was calculated by subtracting what was left at the end of the experiment. The "sac" in which the excrement was voided, was separated from the undigested food, and later the air dried feces were weighed on a chainomatic balance. A total of nineteen records showed that 90.4 per cent of the food eaten was digested and absorbed.

Table VII. Percentage of Food Digested and Absorbed by Birds Fed Finely Cracked Corn.

| Species | Records | Average Amount of Air-dried Food Eaten | Average Amount of Air-dried Excrement | Percentage Digested and Absorbed |
|---|---|---|---|---|
| | | Grams | Grams | |
| Song Sparrow | 11 | 0 254 | 0.0296 | 91.1 |
| Eastern Chipping Sparrow | 3 | 0 334 | 0.060 | 85.3 |
| Eastern Field Sparrow | 3 | 0.207 | 0 015 | 92.9 |
| English Sparrow | 1 | 0.124 | 0 010 | 91.9 |
| Slate-colored Junco | 1 | 0.384 | 0.038 | 90.0 |
| Average of 5 species | (19) | 0.259 | 0.0315 | 90.4 |

### Effect of Environment on Rate of Feeding

Certain environmental factors influence the extent of feeding and may curtail activity along this line for periods of time. Wind or rain storms will send birds hurrying to cover just as periods of intense heat will decrease movements and tend to keep birds rather quiet and in the shade. In this latter case the amount of movement is reduced but some feeding does take place.

In order to study the effect of air temperature upon amount of feeding by birds, a study was made of banding records. For the past several years, intensive bird trapping for banding purposes has been accomplished at the laboratory during the warmer months. Traps were baited with various foods and were visited regularly throughout the day. The birds captured were taken to the laboratory, weighed, and immediately released. The traps were not operated during severe rain storms, although light rain, not lasting over a few hours, does not seem detrimental, as far as occupancy of the traps is concerned.

A survey taken of the number of new, return, and repeat birds in the traps daily was made for the months of June (latter portion only), July, and August of the years 1925, 1926, 1928, and 1930. Birds taken were resident species and included both adults and juve-

nals. Table VIII tabulates trapping of Song, Eastern Field, and Eastern Chipping Sparrows during these months. Some individuals exhibited little fear, visiting the traps four or five times daily for food, and handling does not appear to frighten birds. The trapping days were assorted into groups having the same mean temperature within 5° F., and an average was made of the number of birds taken in the traps on those days. The lower ranges of air temperature are not included since they occur early in the summer when juvenal birds are not available and so are not comparable with records obtained later. A rapid decline is shown in the number of birds trapped daily when the mean daily temperature rises above 71° F.

TABLE VIII. Effect of Daily Mean Temperature on the Feeding and Trapping of Song, Eastern Field, and Eastern Chipping Sparrows.

| Daily Mean Temperature | Number of Days | Average Number Trapped Daily |
|---|---|---|
| 71-75° F. | 71 | 7.6 |
| 76-80° F. | 44 | 4.7 |
| 81-85° F. | 9 | 3.7 |

## SURVIVAL TIME OF BIRDS WITHOUT FOOD

The amount of reserve food in the body which the bird can call on in times of stress is of considerable importance in affecting its abundance and migration. Experiments by S. C. Kendeigh and the author (unpublished) on resistance of birds to various degrees of air temperature show that certain species, such as the English Sparrow, have the longest survival time without food at a relatively high air temperature. Sixteen English Sparrows, confined one or two at a time in an incubator at a constant temperature of 92.2° F. and a relative humidity of 56 per cent, lived. on the average, for 47.9 hours. Apparently death was here due to complete starvation and exhaustion of food reserves. At higher or lower air temperatures, the regulation of body temperature is affected and death comes more quickly, apparently before complete exhaustion of reserve food can take place. The average loss in weight at death of these birds at 92.2° F. was 34.5 per cent of their original weight at the beginning of the experiments. This represents a loss of 0.7 per cent of the original weight during each hour of survival. Excrement was voided more or less regularly throughout the survival period, in spite of the fact that no food was passing through the alimentary tract. It probably consisted largely of urinary wastes. This experiment indicates that even at the most favorable air temperature, the survival time of birds without food is relatively short, although considerable emaciation of the body occurs before death results.

## Discussion

Among many theories as to the cause of bird migration and the determination of the time at which migration occurs, the importance of food has received much support. Change in temperature is another factor of importance and a combination of the food and temperature factors may well be made. Migration in its early stages, according to Taverner (1904), was a dispersal to seek food. This search for a shifting food supply may have become habitual, and the direction and time of this movement may be influenced by temperature. Obtaining an adequate amount of food is necessary to maintain a resistance against low air temperature, particularly at night. The hours of daylight in which this food may be obtained are shorter in winter, and hence those species, which are not physiologically adjusted, migrate out of the region in autumn.

English (1923) has brought out the point that birds that breed in northern latitudes have larger broods than those species that nest further south. There may be some relation here between size of broods and the longer period of daylight available for securing food. This would indicate an advantage in a northward spring migration away from the tropics.

Movements of birds are not all regular migrations but may consist of sporadic invasions or dispersals instigated on most occasions as a search for food. Snowy Owls (*Nyctea nyctea*) travel south at the sign of a scarcity of rabbits, and crossbills and waxwings will move if their winter supply of pine seeds and berries is lacking. Even normal winter residents will effect a slight seasonal movement if the food supply fails. The regular resident species in northeastern United States are those that make use of food not easily obscured by snow.

Food is often an important direct factor controlling the number of species wintering in northern Ohio, wherein climate may act only as an indirect factor. Severe storms with snow obscuring the ground and ice covering tree trunks are fatal to many birds (Rice, 1924; Wetmore, 1926; Errington, 1931). There are some birds capable of withstanding low winter temperatures providing they are able to find food. In mild winters food is less difficult to find and representatives of species that normally move southward may remain in the vicinity. The winter of 1930-31 was a mild one in northern Ohio with little snow. It was accompanied by the occurrence of eighty-three species of birds, some of which are not normally resident at this season, and testified to a sufficient food supply for this population.

Food is also a factor in regulating the abundance of birds. In this instance, food plays a part in determining the relative size of the territory set up by adult birds during the nesting season. In winter great mortality and diminution in abundance of a species may result when food becomes unavailable.

## Summary

1. Passerine birds feed more or less continuously during the daylight hours.

2. Female birds of several passerine species possess relatively longer small intestines than do males, and immature birds of some species possess relatively longer intestines than do the adults. The relative length of the small intestine is uniform among many insectivorous and omnivorous species, but there is an indication that it is longer in some birds living on small mammals, birds, amphibians, and fish.

3. In some species of passerine birds, the first voided excrement from a stomach full of food appears in about one and one-half hours, the last in about two and one-half hours.

4. Some species of birds when feeding on grain daily consume an amount equivalent to 9.6 per cent of their body weight. About 90.4 per cent of the food ingested is utilized by the bird, the rest is excreted.

5. Passerine birds tend to decrease the amount of their feeding on hot days.

6. The survival time of small passerine birds without food is relatively short, even at the most favorable temperature.

7. Food in sufficient quantity is a factor of considerable importance in controlling the migration and regulating the abundance of birds.

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# THE BREEDING BIRDS OF ASHTABULA COUNTY, OHIO

BY LAWRENCE E. HICKS

Ashtabula County, located in the extreme northeastern corner of the state and bordering on Lake Erie and northwestern Pennsylvania, has preserved more relics (both in number of individuals and species) of the northern and northeastern flora and fauna than any other Ohio county. Various physiographic and historical influences, poor drainage of heavy soils having a high water table and a high rainfall-evaporation ratio, have combined to produce in many of the little disturbed areas, cool, moist, humid environments suitable to the preservation of many species now rare or absent in other portions of the state.

Ashtabula is the largest Ohio county, having 687 square miles. The important natural features and the localities of particular ornithological interest can best be located by referring to the accompanying topography map. The county can be divided into two distinct areas, a lake plain belt averaging about three miles in width, and an upland area, including all of the area south of the lake plain. These two areas are separated by a distinct east-and-west escarpment known as the South Ridge, and by a sudden rise from the lake plain to the upland area. Another ridge, North Ridge, parallels about a mile to the north. These ridges are of sandy and gravelly materials and represent the former shore line levels of glacial lakes formed in the past when ice dams blocked the present outlets of the Great Lakes System.

The present lake shore consists of a cliff cut in the till sheet and varying from 10 to 90 feet in height. The lake plain is nearly level, sloping gently to the north, except where affected by stream erosion. Several fine small marshy areas, swamp forests, and ponds are to be found in the lake plain belt. To the east generous remnants remain of the original forest of hemlock, chestnut, and white pine and many of their accompanying species.

Three large streams, Conneaut River, Ashtabula River, and Grand River, flow into Lake Erie. All have remarkably tortuous channels and have cut very deep gorges with rich flora combinations and extreme variations in light and moisture conditions. A branch of the Grand River, Phelps Creek, has cut a similar gorge in the southwestern corner of the county, where many southern species are found which do not occur elsewhere in the county. Another large branch of the Grand, Rock Creek, arises in the large swampy Orwell Bog. This bog is a part of the famous Bloomfield Bog area of Trumbull County and at one time was truly remarkable in many ways, but has had most of its fine features destroyed by the activities of man.

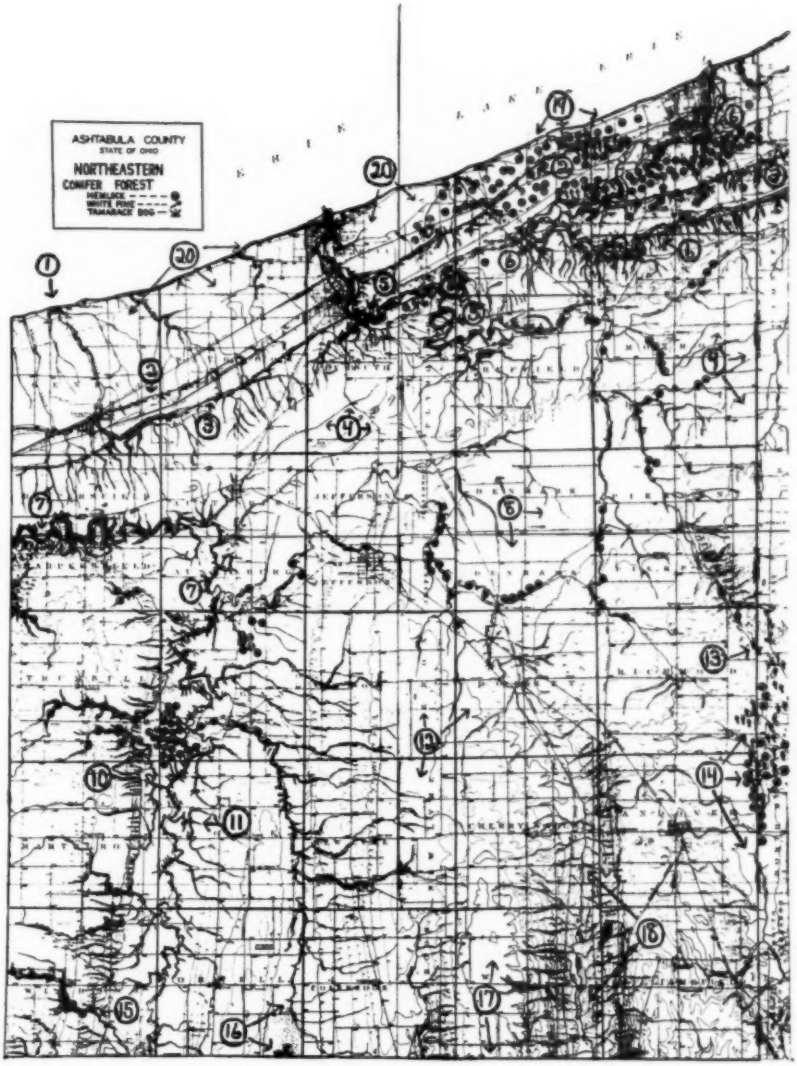


Fig. 11. Map of Ashtabula County, Ohio. This map has been prepared from the Ashtabula, Conneaut, Orwell, and Andover quadrangles of the United States Geological Survey. Stamped overprint indicates the original areas of hemlock, white pine, and tamarack forest. The circled numbers designate the following localities of particular ornithological interest: 1. Geneva-on-the-Lake Marshes. 2. North Lake Ridge. 3. South Lake Ridge. 4. Plymouth Marshes. 5. Ashtabula River Gorge. 6. Conneaut River Gorge. 7. Grand River Gorge. 8. Denmark Township Upland Flats. 9. Eastern Monroe Township. 10. Morgan Swamp. 11. Lake Cardinal. 12. Upland Flats of Lenox, Dorset, and New Lyme Townships. 13. Penn-Line Bog. 14. Pymatuning Bog-Shenango River. 15. Phelps Creek Gorge. 16. Orwell Bog. 17. Wayne Township Upland Flats. 18. Pymatuning River. 19. Lake Belt Hemlock Forests. 20. Lake Belt Swamp Forests.

West of the Grand River, the land rises abruptly by a series of terraces to the upland, much of which is poorly drained and forested by wet beech flats, swamp forest or swamp oak species. Morgan Swamp was formerly a large area covered mostly by a dense hemlock forest. Though sadly exploited, many fine species of flora and fauna still remain. Lake Cardinal, along the east bank of the Grand, is attractive to many bird species. Most of the townships to the south and east, especially Wayne, New Lyme, Lenox, Cherry Valley, Dorset, Denmark, and eastern Monroe, have large areas of upland heavy wet soils covered with little disturbed second growth thickets and swampy forests. The water table is high and the forests very cool with high humidities. Many rare northern plant and animal species occur in regular abundance, the forest floor frequently being carpeted with sphagnum moss or dense growths of ferns or club mosses.

Mosquito Creek, the Shenango River, and the Pymatuning River are the only streams flowing south into the Ohio-Mississippi drainage. The latter stream, especially, has a broad valley with numerous branches and extensive swampy or boggy areas attractive to many rare species. Several boggy areas, including the fine Penn-Line Bog, occur at the headwaters of the Ashtabula River.

The Pymatuning Bog is a crescent-shaped area of about twenty-five square miles of mostly wooded swamp and bog. The major part of the Pymatuning Bog is in Pennsylvania, but the Ohio portion originally covered about 2,200 acres in Richmond, Andover, and Williamsfield townships. The Ohio part, though not so extensive, included some of the best parts of the whole area. All of the bird species reported by Sutton from the Pennsylvania side have been found breeding on the Ohio side and the writer has been able to find but one species of vascular plant in the whole Pymatuning area which has not been collected in the Ohio portion.

The author first became interested in the flora and fauna of Ashtabula County in 1924. For three years thereafter only a limited amount of field work was done, as the area was not readily accessible. During the summer of 1928 and 1929, he was able to engage in field work in the county for the United States Bureau of Plant Industry. Hundreds of miles were covered on foot, systematically surveying areas of all types and penetrating into almost inaccessible thickets, bogs, and swamps, or covering very mediocre appearing localities which might have been considered unproductive and avoided in a biological survey. Thus a most valuable cross-cut study was made of

seven townships of the county and special trips were made to all other areas of importance.

During the summer of 1930 considerable time was spent in the county while making some special studies of the Ruffed Grouse for the Ohio Division of Conservation. In 1932 part of June and nearly all of August and September were spent in revisiting every square of land in the county and checking all previous observations made. During the eight-year period, all other time available during the growing season, was spent in the county or in related studies in Pennsylvania (Pymatuning Bog and Allegany National Forest), southern Ontario, western New York (Allegany State Park), and the White Mountains. This made it possible to become thoroughly acquainted with the characteristic northern flora and fauna and to compare and relate these areas with conditions in northeastern Ohio.

My records show the following field work for Ashtabula County:

| Year | Days in Field | Hours in Field | Miles on Foot | Miles by Auto |
|---|---|---|---|---|
| 1925 | 9 | 68 | 84 | 270 |
| 1926 | 11 | 118 | 107 | 445 |
| 1927 | 14 | 153 | 148 | 572 |
| 1928 | 103 | 1102 | 984 | 4084 |
| 1929 | 71 | 88 | 702 | 3550 |
| 1930 | 31 | 342 | 407 | 3280 |
| 1931 | 28 | 301 | 291 | 2530 |
| 1932 | 47 | 561 | 421 | 5180 |
| Total | 314 | 2733 | 3144 | 19911 |

During this time special ecological studies were made of the breeding bird species and attempts were made to correlate their distribution and numbers with various environmental factors. An attempt was made to collect all of the vascular plants occurring in the county. The state herbarium and my own herbarium now have a total of approximately 4,000 Ashtabula specimens, representing 1,547 vascular plant species. A large number are very rare plants and twenty-nine native species are now known to occur which are unknown elsewhere in Ohio. This is the largest total list and also the largest list of native plants known from any Ohio county. Wherever unusual plant combinations were found ornithological rarities usually accompanied.

The present paper is an attempt to make an accurate historical record of the status of each breeding species of the county. The study on which it is based was a timely one for undisturbed tracts of northeastern types are very rapidly disappearing. Pronounced changes have taken place during the eight years of the study. The breeding

warbler and water bird populations have shifted surprisingly in many localities. Plant life has shown even more conspicuous effects. The foremost influence has been drainage and the rapid lowering of the water table, coupled with the drouth effects of 1930. Lumbering and agricultural operations have made big changes. Most regrettable has been the complete destruction of the Ohio portion of the Pymatuning Bog during 1932 in the construction of a new reservoir. It seems probable that several species will be eliminated as breeding species by these changes and many will be considerably reduced in numbers.

The distribution and abundance of many species of breeding birds are closely linked with the forest types present in the county. The area was formerly heavily forested, small parts of which have never been molested. Extensive areas were only partially lumbered so that many localities now have forests rather similar to the original ones. Many of the heavy soils proved unprofitable for farming, especially after the decline of the dairying industry. Thus hundreds of abandoned farms occur, giving shelter to plant and animal life which would otherwise have disappeared. Many large undrained tracts of 100 to 500 or more acres occur in most sections, representing dozens of mixed combinations in the various stages of reversion to the original forest. This provides a variety of habitats favorable to the support of species of unlike requirements and a diversity and interspersion of types capable of sustaining large numbers of birds per unit of area.

Fine examples of all of the original forest types still remain, occurring in not far from their original proportions, though reduced in area by the cleared land and by the secondary forests and thickets of spice bush, witch hazel, trembling aspen, black cherry, hickory, and white elm. All of the original and present vegetation types occurring in the county were carefully mapped. Types originally represented and the percentage of the total area of the county devoted to each, were approximately as follows: beech-sugar maple, 57%; wet beech flats, 11%; oak-hickory, 4%; oak-chestnut, 10%; white elm-white or black ash-red maple, 10%; hemlock-beech or hemlock-chestnut, 4%; swamp oak, 2%; white pine-chestnut or white pine-hemlock, 1%; tamarack bog, less than 1%.

A beautiful series of succession changes takes place in the bird life of an open area as it is invaded by forest and passes through the thicket stages to a mature sugar maple-beech forest. The forest crown forms and closes over. The temporary species, the lower branches, and all but the most successful individuals, disappear. Great changes take place in the undergrowth and amount of dead tree parts. Various

FIG. 12. A second growth swamp forest in southern Wayne Township, typical of numerous similar areas throughout the county, where a large portion of the forest floor is covered with shallow pools of water throughout the summer months. The constant water supply, low temperature, and high humidities have preserved in abundance many rare northern species.

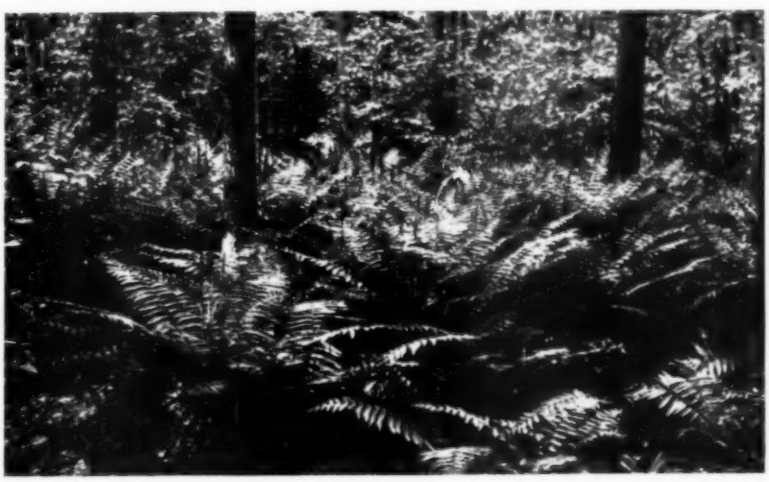

FIG. 13. Luxuriant growth of cinnamon fern in the Pymatuning Bog among tamarack, cranberry tree, and hobblebush. The ground cover is of gold-thread, Clinton's Lily, twin flower, and Dalibarda. Four species of club mosses are common. Sixteen species of warblers nest here.

local conditions may accelerate or retard these changes and variations occur when some other climax type develops. It is extremely fascinating and illuminating to correlate these successions with the successions occurring simultaneously in the bird life.

When from one to ten feet high the tree growth consists mostly of sprouts and seedlings of temporary species and there are large open spaces between the crowns. At this stage five bird species predominate, the Indigo Bunting, the Field Sparrow, the Blue-winged Warbler, the Chestnut-sided Warbler, the Towhee, and in moist areas, the Northern Yellow-throat. When from about ten to eighteen or twenty feet high, the forest crown converges and slowly closes over and soil humus begins to accumulate. The species named begin to disappear and are replaced by the Robin, Red-eyed Vireo, Ovenbird, Rose-breasted Grosbeak, Goldfinch, and Least Flycatcher. When from twenty to thirty-five or forty feet the temporary species disappear, herbacious plants develop on the forest floor and in certain localities young hemlocks begin to develop. The last named species continue and several new ones come in, including the Ruffed Grouse, Scarlet Tanager, Junco, Black-capped Chickadee, and Blue Jay.

At from thirty to fifty feet the smaller dead trees begin to appear, having been overtopped and starved out due to shading by more successful individuals. The Black-throated Green Warbler and in some areas the Blue-headed Vireo appear at this stage. At from fifty to sixty-five feet many large dead trees appear. The Rose-breasted Grosbeak now drops out and a large number of new species come in, including the Wood Thrush, Hairy and Downy Woodpeckers, Crow, Magnolia Warbler, Veery, and in certain areas, the Black-throated Blue Warbler and the Blackburnian Warbler. Finally at from sixty-five to ninety feet the mature forest develops, having numerous old logs and stumps. Where subjected to storms, windfalls and upturned roots modify the habitat. By this time considerable undergrowth has developed which shades out the smaller herbacious plants of the forest floor. The Robin, Ruffed Grouse, and Black-capped Chickadee now disappear and the Wood Pewee, White-breasted Nuthatch, and perhaps the Hooded Warbler, occur for the first time.

Other special studies were made of nesting activities, number of eggs, seasonal variations, extremes of nesting dates, yearly fluctuations and the percentage of successful nestings. The results obtained will be compared with those of studies in other portions of the state and reported upon later. Most of the field work was done individually but on numerous occasions the writer was accompanied on field trips by

S. V. Wharrum, of Austinburg, Robert H. McCormick, of the Ohio Division of Conservation, Charles F. Walker, of the Ohio State Museum, Ray T. Everley, of the United States Bureau of Entomology, Roscoe W. Franks, of the Baldwin Bird Research Laboratories, Roger Conant, of the Toledo Zoological Society, or by various agents of the United States Bureau of Plant Industry. The writer wishes to thank them for frequent valuable assistance in some of the field studies. Only a limited amount of collecting of bird specimens was done as the species involved were all readily identifiable under field conditions and extensive collecting would have made it necessary to curb much of the study program. A number of skins or eggs of the unusual species are to be found in the collections of Otterbein College and the Ohio State Museum. Field workers from the Cleveland Museum of Natural History have also made numerous collections in the Pymatuning Bog region.

The total number of bird species recorded from Ashtabula County which can be regarded as certain breeding species totals 154. The actual breeding of 145 of these has been established by the finding of nests with eggs or young. Juvenile birds, capable of flight, have been observed in the breeding season of most of the remaining species, but these can hardly be interpreted as positive breeding records.

Mr. George M. Sutton, who made a study of the birds of the Pennsylvania portions of the Pymatuning Swamp, listed 134 birds which he considered as nesting species. All of these have been recorded in the Ohio portion of the swamp or elsewhere in the county. Twenty-one species not listed by Sutton for Crawford County, Pennsylvania, are now known as breeding species in Ashtabula County.

The following species on the Ashtabula County list were not regarded definitely as breeding species in Ohio by either Jones or Dawson: Broad-winged Hawk, Eastern Pigeon Hawk, Yellow Rail, Wilson's Snipe, Yellow-bellied Sapsucker, Least Flycatcher, Olive-sided Flycatcher, Red-breasted Nuthatch, Brown Creeper, Hermit Thrush, Blue-headed Vireo, Nashville Warbler, Magnolia Warbler, Black-throated Blue Warbler, Blackburnian Warbler, Pine Warbler, Grinnell's Water-Thrush, Canadian Warbler, Purple Finch, Pine Siskin, Slate-colored Junco, White-throated Sparrow.

At least seventeen other species were recorded in the county during what would be considered the breeding season, but none of them nest. These are: American Egret, Little Blue Heron, Black-crowned Night Heron, Pintail, Shoveller, Osprey, Duck Hawk, Solitary Sandpiper, Greater Yellow-legs, Lesser Yellow-legs, Red-backed Sandpiper,

Semipalmated Sandpiper, Least Sandpiper, Herring Gull, Ring-billed Gull, Common Tern, and Caspian Tern.

Due to drainage resulting in lowering of the water table, and to forestry and agricultural activities, for the most part, the following species can be considered as decreasing in numbers: Broad-winged Hawk, Marsh Hawk, Virginia Rail, American Woodcock, Wilson's Snipe, Yellow-bellied Sapsucker, Least Flycatcher, Tree Swallow, Prairie Marsh Wren, Short-billed Marsh Wren, Veery, Magnolia Warbler, Grinnell's Water-Thrush, Slate-colored Junco, and White-throated Sparrow. To these should be added those rare species known solely or chiefly in the now destroyed Pymatuning Bog.

In the following annotated list the scientific name is followed by a number which indicates the number of nesting records obtained for that species. For the most part this number includes only nests of the species found containing young or eggs. In a few of the rarer species, or those building nests very difficult to locate, the number includes as a nesting record young birds just out of the nest and not capable of sustained flight, even though the actual nest was not found. Birds designated as general occur in at least twenty-five of the twenty-eight townships of the county. Birds listed as rather general probably occur in at least eight or ten scattered townships. Birds having a very discontinuous distribution or occurring in only very small isolated areas are listed as local. The nomenclature used is that of the Fourth Edition (1931) of the A. O. U. Check-List.

## Annotated List

[This list includes 154 breeding species]

Pied-billed Grebe. *Podilymbus p. podiceps.* (2). A rare and irregular summer resident. One nest with eight eggs was found at Ashtabula Harbor pond in July, 1930, and an old bird was seen repeatedly with small young in the marsh at Geneva-on-the-Lake in June, 1931.

Great Blue Heron. *Ardea h. herodias.* Formerly a large colony was located near Jefferson but continued cutting of the nesting trees caused the birds to desert. Two new colonies have been established, neither of which are within the confines of the county, although the birds feed rather commonly over the whole area. One colony was established about 1920 south of Orwell at the junction of Phelps Creek and the Grand River on the Griswold estate, Mesopotamia Township, Trumbull County. The nests, however, are located only a few rods from the Ashtabula County line. They are in beech, sour gum, and red maple trees. This heronry increased to about sixty nests in 1930,

FIGURE 14

FIG. 14. A living tree with decayed heart, in Pymatuning Bog, which has been trademarked by the Pileated Woodpecker. This is the haunt of the Veery, the Sapsucker, the Grinnell's Water-Thrush. Beneath the poison sumac and the royal and cinnamon ferns, the rare painted trilliums, pink lady's slippers, and Pennsylvania saxifrage grow in abundance.

FIG. 15. Open areas of sedges, rushes, or cattails in the Pymatuning Bog which are being invaded by tamarack. In such situations three species of rails, Wilson's Snipe, and the Prairie Marsh Wren breed.

FIGURE 15

but due to cutting of trees and shooting, was reduced to seventeen nests in 1932. The second colony is located south and east of Conneaut across the line a short distance in Pennsylvania, adjacent to the Frank Joiners farm in Beaver Township, Erie County. In 1932 sixteen nests were built.

Eastern Green Heron. *Butorides v. virescens.* (8). General and fairly common but not nearly so numerous as one would expect from the habitats available.

American Bittern. *Botaurus lentiginosus.* (6). Rather rare, a few pairs nesting locally in especially favorable situations.

Eastern Least Bittern. *Ixobrychus e. exilis.* (2). Rare. Two nests with eggs were found in Pymatuning Bog on July 11, 1928, and in Plymouth Marshes on August 3, 1929.

Common Mallard. *Anas p. platyrhynchos.* (2). Very rare and local. A hen bird with six ducklings was studied on a small woodland pond in the Plymouth Marshes, July 4, 1929; and a nest with twelve eggs was found at the Geneva-on-the-Lake Marsh on June 14, 1932.

Common Black Duck. *Anas rubripes tristis.* (5). Rare and local. Old birds with small young were recorded four times, and a nest with nine eggs was found at a small pond south of Ashtabula on June 12, 1931.

Blue-winged Teal. *Querquedula discors.* (1). Very rare. Three adults seen in the breeding season, including a hen with six ducklings at Ashtabula Harbor pond on July 3, 1929.

Wood Duck. *Aix sponsa.* (8). A rare but regular resident locally. Formerly not uncommon in the Plymouth Marsh region but disappearing with the general lowering of the water table. Young birds were recorded on seven occasions and one nest found in Wayne Township on June 10, 1930.

Turkey Vulture. *Cathartes aura septentrionalis.* (8). General but rather uncommon except locally. Much more frequent in late summer and during migrations. Three nests were located in fallen hollow logs, four in hollow broken stubs, while the eighth record is of two half-grown birds which clambered about a brush pile in Wayne Township. The eggs, apparently, had been placed in a small depression on the ground between the roots of a tree stump which was partially covered by the brush pile.

Sharp-shinned Hawk. *Accipiter v. velox.* (2). Rare, though more common than sight records of adults would indicate. A nest with five eggs was found along the lower Grand River near the Lake County line in a tall white pine on July 12, 1928, and a second with four

newly hatched young in the white pine forest at Farnham along the Conneaut River on June 14, 1931.

Cooper's Hawk. *Accipiter cooperi.* (6). Uncommon to rare and local. Most frequent along the Conneaut, Ashtabula, and Grand Rivers. A nest found in a hemlock at Phelps Creek on July 21, 1929, contained two hatching eggs and a young bird which could have been no less than ten days old.

Eastern Red-tailed Hawk. *Buteo b. borealis.* (18). General and fairly common.

Northern Red-shouldered Hawk. *Buteo l. lineatus.* (3). Local and uncommon to rare.

Broad-winged Hawk. *Buteo p. platypterus.* (3). Very rare and local. Three nests; three young on July 12, 1928, in Wayne Township; four young on July 12, 1930, at Pymatuning Bog; and four eggs on June 13, 1931, in eastern Monroe Township.

Northern Bald Eagle. *Haliaeetus leucocephalus alascanus.* (10). Adults rather frequently seen in summer, especially near the lake shore and along the three large rivers emptying into the lake. Sometimes several adults and a number of the immature are seen at the same time but there is no evidence of more than one pair nesting each year, at least in recent years. Residents report that eagles have nested somewhere in Saybrook or Geneva Townships for at least seventy years, the nests usually being placed in numerous suitable forest tracts within one or two miles of the lake shore. In the last eight years no less than ten nests have been built at six different locations, the first nest having been destroyed by storms on two occasions.

Marsh Hawk. *Circus hudsonicus.* (18). Numerous nests have been found due to much work in suitable locations, but the species must be regarded as a rather uncommon and local summer resident.

Eastern Pigeon Hawk. *Falco c. columbarius.* Adults have been recorded foruteen times during the breeding season, mostly along the Conneaut, Ashtabula, and Grand River gorges. Although no nests have been found the species certainly breeds. In August, 1932, an adult was seen repeatedly along the lower Grand River near the Lake County line, and on August 18 an immature of the species was seen with an adult.

Eastern Sparrow Hawk. *Falco s. sparverius.* (19). General and common.

Eastern Ruffed Grouse. *Bonasa u. umbellus.* (16). Occurs at least sparingly in every township and is often locally common to abundant, especially to the south and east. There has been consid-

erable fluctuation in numbers during the eight years of field work. Special studies of this species made in part for the Ohio Division of Conservation, will be reported upon later. From July 5 to September 29, 1928, 848 miles were covered on foot and 309 grouse recorded, or four per day. In 1929, from July 5 to August 1, 186 grouse were counted in 263 miles, or seven per day. Most of these birds were seen in Wayne, Williamsfield, Cherry Valley, Andover, Monroe, and Orwell Townships.

European Partridge. *Perdix p. perdix.* (3). The county game protector liberated twenty-four adult birds in Cherry Valley Township in the spring of 1930. At least two broods of young were raised that year and a nest with twelve eggs was found in the southwestern corner of the township on June 14, 1931. No trace of the birds was found in 1932 and it is believed that they will soon entirely disappear, as the county is not suited to their requirements.

Eastern Bob-white. *Colinus v. virginianus.* (32). General and common to uncommon or rare. Numbers are everywhere less than are to be found in most other counties of the state. Much of the county is too northern in its general aspects to be suitable for the species and it appears to be entirely absent from a number of large tracts rich in boreal flora and fauna.

Ring-necked Pheasant. *Phasianus colchicus torquatus* . (4). Pheasants have been planted repeatedly in the county, and recently a number of pairs nearly every year. The birds survive but do not increase to any great extent and do not hold up very well under hunting. They appear to be entirely absent from about half of the townships and range from rare to locally common in the remainder.

Eastern Turkey. *Meleagris gallopavo silvestris.* Reported by the older residents to have been at one time a general resident of the county, being locally common to abundant, especially in the Pymatuning Bog area. The last birds seem to have disappeared about 1880.

King Rail. *Rallus e. elegans.* (2). Very rare and local. A nest with seven eggs was found at the Ashtabula Harbor pond on June 30, 1928, and an adult with at least four young at Pymatuning Bog on June 15, 1931.

Virginia Rail. *Rallus l. limicola.* (8). Rather general in suitable areas but local and rather uncommon.

Sora. *Porzana carolina.* (2). Rather rare though much more frequent than adults seen would indicate. One nest with eight eggs at Geneva-on-the-Lake Marsh on June 6, 1925, and another with ten eggs in the Pymatuning Bog, July 7, 1929.

YELLOW RAIL. *Coturnicops noveboracensis.* No nests found but an adult seen in the Pymatuning Bog, July 2, 1928, and an immature bird about half grown found dead at the same place on the Pennsylvania-Ohio line, August 9, 1932.

FLORIDA GALLINULE. *Gallinula chloropus cachinnans.* (2). Rare and irregular summer resident and not known except along the lake shore. An adult observed with four young at Geneva-on-the-Lake Marsh on August 8, 1924, and a nest with seven eggs was found at Ashtabula Harbor pond on June 12, 1931.

AMERICAN COOT. *Fulica a. americana.* (1). Rare and irregular summer resident and not recorded except near the lake shore. One nest with eleven eggs found at Geneva-on-the-Lake Marsh on July 3, 1928.

PIPING PLOVER. *Charadrius melodus.* (1). Though repeatedly searched for, this species was unknown until June 16, 1933, when Floyd B. Chapman and the writer collected a set of three eggs on West Ashtabula Beach.

KILLDEER. *Oxyechus v. vociferus.* (31). General and common to abundant.

AMERICAN WOODCOCK. *Philohela minor.* (18). General and locally common to abundant. The species nests early before the majority of the field work was done, but six nests were found with eggs in June, three in July, and one nest with four eggs hatched in Wayne Township on August 7, 1928. During the summer months family groups with young were frequently encountered. In 1928 the number of birds recorded by months was as follows: July, 143; August, 101; and September, 96. In 1929, 205 were found during the month of July. Drainage with resultant lowering of the water table and the effects of the drouth of the summer of 1930 have greatly reduced the number of breeding birds and the habitats suitable for the species. The woodcock migrates early and many of the birds seen during the latter part of the summer are not to be regarded as breeding birds. On twelve occasions more than 100 birds were counted per day during the fall migration.

WILSON'S SNIPE. *Capella delicata.* (7). Recorded from twelve localities in the eastern and southern parts of the county during the summer season, and sometimes rather common locally though seldom observed. The nests are difficult to locate, only one being found, Pymatuning Bog, May 30, 1931, with four eggs. Adults with young were seen on six occasions: southern Wayne Township, July 6, 1928, June 30, 1929, and June 13, 1932; Plymouth Marshes, May 30, 1930;

Pymatuning Bog, July 2, 1929, and June 14, 1932. The species varies greatly from year to year with fluctuation in the water level and is rapidly disappearing with increased drainage and cultivation or burning of the marshy tracts of cattails and sedges. In 1928 a careful census on several successive evenings indicated that no less than fourteen pairs were breeding in the Ohio portion of the Pymatuning Bog or within three-quarters of a mile of the state line. In 1929 about sixteen pairs bred, in 1930 only six pairs were indicated, in 1931, eleven pairs, and in 1932, eight pairs.

Upland Plover. *Bartramia longicauda.* (6). Rather general but uncommon, local and somewhat variable from year to year. More frequent to the south.

Spotted Sandpiper. *Actitis macularia.* (7). Local and uncommon to the south but common to abundant near the lake shore.

Black Tern. *Chlidonias nigra surinamensis.* (2). Very rare and irregular summer resident. One pair nested at Geneva-on-the-Lake Marsh, July 3, 1928, and another at Ashtabula Harbor pond, June 16, 1932.

Eastern Mourning Dove. *Zenaidura macroura carolinensis.* (164). General and abundant.

Passenger Pigeon. *Ectopistes migratorius.* Formerly irregularly very abundant in the county and nesting in small numbers according to numerous reports of old residents of the county. Pigeons were said to be numerous in the Pymatuning Bog region, the Plymouth Marshes, and in the Orwell Bog, where large roosts existed for several years. The birds apparently became scarce after about 1870 and were not reported at all after 1890.

Yellow-billed Cuckoo. *Coccyzus a. americanus.* (14). General but not common and rather local.

Black-billed Cuckoo. *Coccyzus erythropthalmus.* (28). General though local, ranging from rare to abundant; especially common in the large areas of aspen thickets and bordering the boggy or swampy areas. Probably three or four times as common as the preceding species.

Barn Owl. *Tyto alba pratincola.* (3). Apparently generally distributed but rare, especially in the areas characterized by northern species.

Eastern Screech Owl. *Otus asio naevius.* (7). More common than the preceding but rare compared to its numbers in most other areas of the state.

GREAT HORNED OWL. *Bubo v. virginianus.* (12). General but rather uncommon.

NORTHERN BARRED OWL. *Strix v. varia.* (6). Well distributed but uncommon.

LONG-EARED OWL. *Asio wilsonianus.* (2). Local and rare except in the Pymatuning Bog region. Two nests found with young: Pymatuning Bog, July 8, 1929, and lower Grand River near the Lake County line, June 10, 1931.

SHORT-EARED OWL. *Asio f. flammeus.* (2). Rare and local. Two nests found, both with young: Plymouth Marshes, May 30, 1930, and Pymatuning Bog, May 31, 1931.

SAW-WHET OWL. *Cryptoglaux a. acadica.* (2). Rare though probably undetected in many localities. Adults recorded twelve times from seven localities during the summer season. A family group of two adults and four young were observed near Austinburg, July 4, 1928. A nest with three young located in the Pymatuning Bog in a hollow stub in a hemlock grove, was found May 30, 1931.

EASTERN WHIP-POOR-WILL. *Antrostomus v. vociferus.* (2). Rather rare and local. The two nests found were in the Phelps Creek region.

EASTERN NIGHTHAWK. *Chordeiles m. minor.* (7). Not known to nest in natural situations anywhere in the county. Several pairs nest regularly on the roofs of buildings at Ashtabula, Conneaut, and Geneva. Occasionally one or two pairs nest at Andover, Jefferson, and North Kingsville. Not known to occur elsewhere.

CHIMNEY SWIFT. *Chaetura pelagica.* (28). Abundant, even in most of the rural districts, where it builds numerous easily observed nests in the chimneys of the hundreds of abandoned farm houses.

RUBY-THROATED HUMMING BIRD. *Archilochus colubris.* (11). Common to abundant. Most of the nests found were on small downward sloping branches of trees arching over small streams. Most of the nests were built in July and three sets of eggs did not hatch until after August 15.

EASTERN BELTED KINGFISHER. *Megaceryle a. alcyon.* (12). Common. More frequent to the north and along the lake shore.

NORTHERN FLICKER. *Colaptes auratus luteus.* (58). Abundant.

NORTHERN PILEATED WOODPECKER. *Ceophloeus pileatus abieticola.* (18). Adults have been recorded in summer from all but one of the twenty-eight townships in the county. The species ranges from rare to very common, being most numerous to the east and south. Forest areas are well distributed and due to the general high humidity of these tracts, injured trees decay rapidly producing an abundance of

large insect-infested stubs. During mating activities, from five to seven adults have been observed at one time on numerous occasions. Several nests were found in the Pymatuning Bog area, Denmark Township, and Wayne Township, where the birds could on occasion be approached closely and observed for hours at a time. The species is everywhere much commoner than the preliminary field investigations would seem to indicate; a thorough knowledge of the locality, the habits of the birds, and the various call notes being necessary to accurately census an area. The number of birds recorded on field trips of the last five years was as follows: 1928, 46; 1929, 37; 1930, 28; 1931, 44; and 1932, 78.

Red-bellied Woodpecker. *Centurus carolinus.* (3). Rare but found occasionally in most localities except those characterized by northern forms.

Red-headed Woodpecker. *Melanerpes erythrocephalus.* (46). General and common to abundant, except in some of the poorly drained or northern areas.

Yellow-bellied Sapsucker. *Sphyrapicus v. varius.* (16). Very local but observed in twelve different localities in summer, mostly in the eastern and southern townships. The species seems to be disappearing rapidly with drainage and continued timbering but is still not uncommon locally in the Pymatuning Bog area and in parts of Wayne and Denmark Townships. Most of the nests were found in yellow birch snags in the wet beech flat tracts or in aspen stubs bordering boggy areas. The adults are observed with difficulty during the nesting season and can easily be missed in a tract having several breeding pairs.

Eastern Hairy Woodpecker. *Dryobates v. villosus.* (21). General and common to abundant.

Northern Downy Woodpecker. *Dryobates pubescens medianus.* (46). General and abundant.

Eastern Kingbird. *Tyrannus tyrannus.* (18). General and common to abundant.

Northern Crested Flycatcher. *Myiarchus crinitus boreus.* (14). General and common.

Eastern Phoebe. *Sayornis phoebe.* (87). General and common to abundant.

Acadian Flycatcher. *Empidonax virescens.* (6). Fairly common but rather local and even absent from some localities.

Alder Flycatcher. *Empidonax t. trailli.* (24). Fairly common but local and absent from some localities.

LEAST FLYCATCHER. *Empidonax minimus.* (4). A rather rare summer resident but more frequent than casual observations would indicate. Birds have been recorded in summer from twelve localities, including several in Wayne Township, the Pymatuning Bog area and eastern Monroe Township. Numbers appear to vary greatly from year to year and few have been seen since the 1930 drouth. Nests are placed in alders, willows, yellow birch, and occasionally at considerable height in red maples.

EASTERN WOOD PEWEE. *Myiochanes virens.* (5). Usually a very common summer resident and even abundant in some forest areas, being one of the most characteristic species of large wooded tracts.

OLIVE-SIDED FLYCATCHER. *Nuttallornis mesoleucus.* (1). Very rare. Three summer records from the Pymatuning Bog, one from Wayne Township, and one from eastern Monroe Township. On June 16, 1932, a nest was located adjacent to the Pymatuning Bog. The nest was placed near the tip of one of the uppermost branches of a white pine and was inaccessible. One adult was incubating, returning to the nest three times upon being flushed, and another was observed about a quarter of a mile distant.

PRAIRIE HORNED LARK. *Otocoris alpestris praticola.* (1). Very local but sometimes not uncommon summer resident, but entirely absent from many large areas. The species nests very early in the spring, usually before the commencement of most of the field work, so that only one nest was found. By June and July the young fly well and groups of five to fifty are occasionally seen feeding in localities where they are not known to nest.

TREE SWALLOW. *Iridoprocne bicolor.* (4). Very rare and irregular. In 1929 four pairs nested in hollow snags in the Pymatuning bog but no birds were present during the following years and no evidence of nesting elsewhere in the county was obtained.

BANK SWALLOW. *Riparia r. riparia.* (410+). Rare or absent except near the lake shore and exceedingly variable in numbers from year to year. Formerly a few pairs nested in banks along the Ashtabula, Conneaut, and Grand Rivers but none have been seen since 1929. Several colonies have been established in the high banks along the lake shore, growing to large size and then being deserted in three or four years. Sometimes a few pairs nest in low sand cuts of the old lake ridges some distance back from the lake. The only nests found in 1932 were a dozen in a small bank at the golf course at Conneaut.

ROUGH-WINGED SWALLOW. *Stelgidopteryx ruficollis serripennis.* (180+). Very local. Absent in much of the southern half of the

county but locally common to abundant near the lake shore, especially along the gorges of the three large rivers.

Barn Swallow. *Hirundo erythrogaster.* (680+). Common to abundant to the south but usually very abundant near the lake shore. Nests are frequently found in numbers about deserted farm buildings.

Northern Cliff Swallow. *Petrochelidon a. albifrons.* (42). Extremely local and variable from year to year but known from seventeen localities in summer, mostly in Monroe, Pierpont, Richmond, and Andover Townships. Not more than six nests have been found in any one locality.

Purple Martin. *Progne s. subis.* (411). Rather general and common to abundant. Rather infrequent in most rural districts, most of the birds nesting in houses erected for them in the villages and cities. Most numerous near the lake shore.

Northern Blue Jay. *Cyanocitta c. cristata.* (10). General and well distributed but ranging from uncommon to abundant. Most numerous in the oak areas.

Eastern Crow. *Corvus b. brachyrhynchos.* (34). General and usually very abundant.

Black-capped Chickadee. *Penthestes a. atricapillus.* (32). General and usually common to very abundant.

Carolina Chickadee. *Penthestes c. carolinensis.* Apparently rather rare but may have been passed by for the preceding species in some localities. The only positive records in summer are several from the Phelps Creek region where many other southern forms occur. No evidence of nesting was obtained but the species certainly does breed. at least in Windsor Township.

Tufted Titmouse. *Baeolophus bicolor.* (11). A fairly common summer resident, most frequent where other southern forms occur and entirely absent from many areas dominated by northern species.

White-breasted Nuthatch. *Sitta c. carolinensis.* (3). General and common.

Red-breasted Nuthatch. Sitta canadensis. (2). Rare and irregular. Adults were recorded from a tract in southern Wayne Township in 1928, 1929, and 1931, including two young just out of nest being fed by adults, July 18, 1929. On June 13, 1931, a nest was found in the Pymatuning Bog in a red maple tree at a height of forty feet. The cavity was surrounded by live wood, the birds entering through a tiny knot hole which had nearly grown over. Though almost unobservable, the nest appeared to be made mostly of grass and contained at least five eggs.

Brown Creeper. *Certhia familiaris americana.* (1). Very rare and local. Adults seen in southern Wayne Township on July 29, 1928, July 17, 1929, and June 10, 1931, and in the Pymatuning Bog on August 3, 1929, May 30, 1930, and June 12, 1931. On the last date three young were observed to leave a nest placed at a height of twenty-two feet in a large split fork of a white elm, but only one of the adults could be located.

Eastern House Wren. *Troglodytes a. aedon.* (207). General and usually very abundant, nesting in great numbers in the wealth of suitable cavities found in the combination second growth cut-over areas. Usually more numerous in the wilder areas away from the haunts of man, where it is not unusual to find ten or twelve occupied nests in a single day.

Bewick's Wren. *Thryomanes b. bewicki.* Very rare and not definitely known to breed. The only summer records are of adults recorded from Phelps Creek, July 18, 1929, and June 22, 1931. Probably a recent invader.

Carolina Wren. *Thryothorus l. ludovicianus.* (2). Very rare. Only two pairs have been located; one nested and was seen with five young along Phelps Creek, June 10, 1930; the other pair was observed along the lower Grand River in Harpersfield Township with five young just out of nest, June 14, 1932.

Prairie Marsh Wren. *Telmatodytes palustris dissaeptus.* (47). A very local and uncommon summer resident except in the Pymatuning Bog region where it is irregularly abundant, nesting in either cattail or sedge clumps.

Short-billed Marsh Wren. *Cistothorus stellaris.* (2). Recorded in summer from six scattered localities in the county but it must be regarded as rare and irregular except in the Pymatuning Bog region where at least seven pairs nested in the Ohio portion in 1931, two nests with five young each being found on June 15, 1931.

Eastern Mockingbird. *Mimus p. polyglottos.* (1). Very rare. Unknown until 1932 when a nest with four young was found in a grove of thornapple trees at Stanhope in southern Williamsfield Township, on June 14.

Catbird. *Dumetella carolinensis.* (48). General and common to very abundant. Most numerous in the wilder boggy areas.

Brown Thrasher. *Toxostoma rufum.* (14). Rather local and ranging from uncommon to common.

Eastern Robin. *Turdus m. migratorius.* (264). General and very abundant, even in most of the wilder areas far from the haunts of man.

Wood Thrush. *Hylocichla mustelina.* (28). A general and common summer resident except in the wilder boggy areas where it is displaced by the Veery and in a few other localities where it appears to be local or entirely absent.

Eastern Hermit Thrush. *Hylocichla guttata faxoni.* (1). Very rare. Known only from the Pymatuning Bog area where adults were observed on July 9, 1928, May 30, 1930, and June 15, 1932. On the latter date a nest was found with four recently hatched young.

Veery. *Hylocichla f. fuscescens.* (24). General and ranging from uncommon to abundant, though absent from some areas. Most numerous in dense moist thickets with a great variety of undergrowth. Sometimes nesting begins as early as May 10, several nests with small young having been found before June 1.

Eastern Bluebird. *Sialia s. sialis.* (38). General and common to very common.

Blue-gray Gnatcatcher. *Polioptila c. caerulea.* (1). Rare but recorded in summer from seven scattered localities. The only nest found was on Phelps Creek, June 10, 1931. Most of the county is apparently too northern in its general aspects to be attractive to this species.

Cedar Waxwing. *Bombycilla cedrorum.* (13). A rather general and very irregular uncommon to abundant summer resident. Most of the nests found were in orchards or in alders in wet areas.

Migrant Shrike. *Lanius ludovicianus migrans.* (8). Rather uncommon and local. Most frequent near the lake shore.

Starling. *Sturnus v. vulgaris.* (68). General and usually abundant but entirely lacking from some localities. Mr. S. V. Wharrum, of Austinburg, reports observing the species every year since 1919, the first record being obtained late in 1918. The first known nestings occurred in 1921 and the species rapidly increased as a summer resident. By 1928 it was established in practically its present numbers, little change in distribution being noted since then except the invasion of several localities and habitat types not occupied in the early years.

Yellow-throated Vireo. *Vireo flavifrons.* (3). A rather general but rare summer resident, though more frequent than casual observations would seem to indicate. It is a bird of the larger forests, the nests found being located near the tops of very tall red maples. curred in 1921 and the species rapidly increased as a summer resi-

dent. Adults were observed in the Morgan Swamp on July 21, 1928; southern Wayne Township on July 6, 1928, and July 8, 1929; Pymatuning Bog, May 30, 1930, and June 12, 1931, when a nest with four eggs was found; eastern Monroe Township, July 11, 1930, nest with three eggs.

Red-eyed Vireo. *Vireo olivaceus.* (226). A general and usually extremely abundant summer resident, the second growth forests attracting larger populations than I have ever seen elsewhere. Frequently parasitized by the Cowbird. Nesting begins in May and June but a large number of occupied nests can be found in July and a few even in mid-August.

Eastern Warbling Vireo. *Vireo g. gilvus.* (3). A fairly common summer resident but usually found nesting only in roadside trees and about towns and cities.

Black and White Warbler. *Mniotilta varia.* (2). Rather general but rare and very local. More frequent to the south and east. A pair with three young were recorded from southern Wayne Township, July 18, 1928, and a nest with four eggs was found in the Pymatuning Bog, June 14, 1931.

Golden-winged Warbler. *Vermivora chrysoptera.* (3). Rather general but very local and decidedly uncommon or rare. Adults have been observed in eight scattered localities. Groups of four and three young just out of nest were observed in southern Wayne Township on July 5, 1928, and another pair was engaged in feeding a single bird in eastern Monroe Township on June 15, 1931.

Blue-winged Warbler. *Vermivora pinus.* (8). Rather local but ranging from rare to abundant. More frequent to the south and east, especially in moist thickets and adjacent to boggy areas.

Brewster's Warbler. *Vermivora leucobronchialis.* (3). This hybrid appears to occur about as commonly as the Golden-winged Warbler, as adults have been recorded fourteen times. No evidence of nesting of this hybrid was obtained, in fact the behavior of individuals suggested in most cases that they were non-breeding birds. On three occasions a male golden-wing and a female blue-wing have been found feeding hybrid young. On May 29, 1930, the writer found a nest with five eggs being incubated by a female blue-wing in southern Wayne Township. The next day, upon returning with Robert H. McCormick and Roscoe W. Franks, it was found that the eggs were hatched, several stills and movie pictures being taken of the hybrid young being fed by both parents at the same time, the female blue-wing and the male a typical Golden-winged Warbler. In 1931, in the

same locality, a male Blue-winged Warbler was seen courting a female Golden-winged Warbler.

NASHVILLE WARBLER. *Vermivora r. ruficapilla.* (1). Very rare and local. Adult males observed in eastern Monroe Township on July 1, 1929, and in northern Wayne Township on July 28, 1928. Not positively identified in the Pymatuning Bog area until June 15, 1931, when a male was observed feeding a fledgling just out of the nest.

NORTHERN PARULA WARBLER. *Compsothlypis americana pusilla.* (1). Very rare. Observed along both the Grand and Ashtabula River gorges in summer but nesting appeared doubtful. A pair was present

FIG. 16. A male Golden-winged Warbler bringing food to five newly hatched hybrid young which are being brooded over by the female Blue-winged Warbler. Enlarged from a movie film taken by Roscoe W. Franks and the author in southern Wayne Township on May 30, 1930.

on Phelps Creek in 1928, 1929, and 1932 but no birds were detected in the other years. Three other summer records of males in unlikely nesting localities, suggested that unmated birds may wander considerably. Two pairs were present in the Pymatuning Bog area in 1929, 1930, and 1931, a nest with three large young being found on June 15, 1931, in a large hemlock.

EASTERN YELLOW WARBLER. *Dendroica a. aestiva.* (32). General and common to abundant.

MAGNOLIA WARBLER. *Dendroica magnolia.* (3). A very local rare to uncommon summer resident, being more frequent to the south and

east. A pair of adults was observed feeding three young just out of the nest on July 8, 1928, in northern Wayne Township. Also recorded from Ashtabula River gorge, Phelps Creek, Morgan Swamp, Denmark Township, and eastern Monroe Township. On June 10, 1931, a small fledgling was seen attended by adults in the Pymatuning Bog and on June 14 a nest with four eggs was found in a dense clump of hemlocks south of Conneaut.

Black-throated Blue Warbler. *Dendroica c. caerulescens.* (2). Very rare and local. Recorded from only two localities. A pair was watched feeding three young in southern Wayne Township on July 7, 1928. Adults were seen again on four occasions in July, 1929, but no nests or young were found. Repeated search in the Pymatuning Bog failed to find the species until June 11, 1931, when by the most fortunate of accidents, a nest with four eggs was found at a height of four feet in a forked branch of poison sumach.

Black-throated Green Warbler. *Dendroica v. virens.* (8). Rather general but quite local and uncommon. Usually not found except where hemlock occurs. On seven occasions adults were observed feeding young unable to fly well, but the only nest found was one with four newly hatched young located at a height of eighteen feet in a dense clump of hemlock in northern Kingsville Township.

Cerulean Warbler. *Dendroica cerulea.* (3). Fairly common but rather local, being confined mostly to more upland areas of beech or oak forest.

Blackburnian Warbler. *Dendroica fusca.* (1). Very rare and extremely local. Known from only two localities. An adult male was observed repeatedly in June, 1931, in the Pymatuning Bog and another in an area of hemlock in northern Kingsville Township, but no evidence of nesting could be found. In 1932 a nest with four small young was found at the latter place at a height of twenty-four feet in a clump of hemlocks.

Chestnut-sided Warbler. *Dendroica pensylvanica.* (6). Rather general and very local but sometimes common. Observed in thirty-two localities, most of which are in the eastern half of the county, especially Monroe, Sheffield, and southern Conneaut and Kingsville Townships.

Northern Pine Warbler. *Dendroica p. pinus.* Very rare and local. No nests and only three summer records: northern Kingsville Township, July 8, 1929, northwestern Conneaut Township, July 12, 1930, and Pymatuning Bog, June 12, 1931.

Oven-bird. *Seiurus aurocapillus.* (83). General and usually very abundant, being one of the most characteristic birds of large areas. Nests with either young or eggs are very easy to locate and it is easily possible to find a half dozen in a single day.

Grinnell's Water-Thrush. *Seirus noveboracensis notabilis.* (4). Recorded in summer from eight scattered localities in boggy areas but rare except in the Pymatuning Bog where a survey in June, 1932, indicated that no less than twenty-two pairs were present. After days of search during five seasons, a nest with four hatching eggs was finally discovered on June 15, 1932, marvelously concealed among roots imbedded in a small mound of rotted wood. On several occasions partly grown young were flushed from nests without it being possible to locate the nest itself.

Louisiana Water-Thrush. *Seiurus motacilla.* (1). Rather rare and very local but found in seven scattered localities where swift flowing streams have cut small suitable gorges. Not known in the numerous cuts near the lake.

Northern Yellow-throat. *Geothlypis trichas brachidactyla.* (14). General and common to very abundant.

Yellow-breasted Chat. *Icteria v. virens.* (6). Rather general but local and decidedly uncommon.

Hooded Warbler. *Wilsonia citrina.* (6). Rather general and very local, ranging from rare to uncommon, except along the gorges of the Ashtabula, Conneaut, and Grand Rivers where it is sometimes common.

Canadian Warbler. *Wilsonia canadensis.* (2). A few pairs nest regularly in the Pymatuning Bog, a nest with four eggs being found there on June 13, 1932, and an adult with two fledglings on July 28, 1928. Rare elsewhere in the county, only eight other records from five localities being obtained, all from the eastern half.

American Redstart. *Setophaga ruticilla.* (18). General and somewhat local but ranging from uncommon to abundant. A characteristic species of large areas.

English Sparrow. *Passer d. domesticus.* (165+). General and usually very abundant but absent from the wilder areas.

Bobolink. *Dolichonyx oryzivorus.* (131). General though somewhat local and ranging from uncommon to very abundant. Often nests in colonies, sometimes nearly a dozen nests being revealed during the mowing of one meadow.

Eastern Meadowlark. *Sturnella m. magna.* (24). General and common to very abundant wherever open areas occur.

EASTERN RED-WING. *Agelaius p. phoeniceus.* (460+). General and often very abundant, but somewhat local.

ORCHARD ORIOLE. *Icterus spurius.* (2). Very rare or absent except near the lake shore where it is not uncommon, though quite local.

BALTIMORE ORIOLE. *Icterus galbula.* (21). General and common. Somewhat local.

BRONZED GRACKLE. *Quiscalus quiscula aeneus.* (64). General and common. Less frequent in the rural districts except in trees about dwellings.

EASTERN COWBIRD. *Molothrus a. ater.* (171). General and abundant, its eggs being found in 171 nests (of sixteen other species) located. Most of these were in nests of the Red-eyed Vireo, Song Sparrow, Field Sparrow, and Chipping Sparrow.

SCARLET TANAGER. *Piranga erythromelas.* (6). General and common.

EASTERN CARDINAL. *Richmondena c. cardinalis.* (14). General and common, though somewhat local and absent from some of the areas of northern character. Three townships carefully censused in 1928 were again covered in 1932. The results would indicate that the species had in some cases increased in numbers five or six times during the interval.

ROSE-BREASTED GROSBEAK. *Hedymeles ludovicianus.* (12). General, ranging from uncommon to very common. Quite local.

INDIGO BUNTING. *Passerina cyanea.* (8). General and common to abundant.

DICKCISSEL. *Spiza americana.* Unknown except for a single adult seen near Geneva on July 31, 1929, and another near Saybrook, June 16, 1931.

EASTERN PURPLE FINCH. *Carpodacus p. purpureus.* (1). Unknown in the county except in the Pymatuning Bog area where single adults were observed each year from 1928 to 1932. On June 15, 1931, a nest with three large young was found at the height of twenty-six feet in a tamarack.

NORTHERN PINE SISKIN. *Spinus p. pinus.* Unknown in the county except in the Pymatuning Bog area where adults were recorded on July 21, 1928, August 1, 1929, and July 10, 1930. Nesting, according to Sutton, probably takes place so early that the season was past before most of the field work began. The species certainly breeds, though perhaps not on the Ohio side of the bog.

EASTERN GOLDFINCH. *Spinus t. tristis.* (21). Common to abundant though somewhat local and variable in numbers.

Red-eyed Towhee. *Pipilo e. erythrophthalmus.* (43). Usually common to abundant. A characteristic bird of large areas, sometimes being very abundant and often the most conspicuous species in brushy tracts.

Eastern Savannah Sparrow. *Passerculus sandwichensis savanna.* (6). Rather general, absent from some localities and ranging from rare to abundant in others. Decidedly local and also variable from year to year. More frequent to the south and east, especially in grassy areas of deserted fields in Andover, Richmond, Monroe, and Pierpont Townships.

Eastern Grasshopper Sparrow. *Ammodramus savannarum australis.* (6). General and common to very common in all open areas.

Western Henslow's Sparrow. *Passerherbulus h. henslowi.* (3). Rather general but very local and variable from year to year. In all, eighty-seven colonies of two to fourteen pairs each were located but the greatest number known in any one years was considerably less. Much more frequent in the seven eastern townships.

Eastern Vesper Sparrow. *Pooecetes g. gramineus.* (18). General and common to abundant.

Eastern Lark Sparrow. *Chondestes g. grammacus.* Not definitely known to breed and only one summer record, an adult studied June 17, 1932, in a sandy prairie area near Saybrook.

Slate-colored Junco. *Junco h. hyemalis.* (14). Absent except from twelve scattered localities, all in the eastern half of the county. Adults with fledglings and at least one nest were found in both southern Wayne Township and eastern Monroe Township each year from 1928 to 1932. Curiously, only two or three pairs nested in the Ohio portion of the Pymatuning Swamp, while at least fifty pairs nested in eastern Monroe Township until the drouth of 1930.

Eastern Chipping Sparrow. *Spizella p. passerina.* (24). Common everywhere in the cultivated districts but practically absent from the wilder portions.

Eastern Field Sparrow. *Spizella p. pusilla.* (27). General and usually abundant.

White-throated Sparrow. *Zonotrichia albicollis.* (4). Very rare and local, being known from only two localities. Adults were seen with young out of the nest in southern Wayne Township on July 6, 1928, July 16, 1929, and July 14, 1930. On June 14, 1932, a nest with three small young was found in the Pymatuning Bog in a clump of shining club moss and American yew.

SWAMP SPARROW. *Melospiza georgiana.* (2). Extremely local and usually rare. About seven pairs nested in the Ohio portion of the Pymatuning Bog in 1932 and two nests, each with four young, were located there on June 17, 1932, by following the adults carrying food. Apparently very variable from year to year. Other localities where the species has been found in summer include Geneva-on-the-Lake Marsh, Ashtabula Harbor pond, a pond near Conneaut, Plymouth Marsh, near Orwell, and a boggy area along the Pymatuning River in southern Wayne Township.

MISSISSIPPI SONG SPARROW. *Melospiza melodia beata.* (84). General and usually very abundant.

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DEPARTMENT OF BOTANY, OHIO STATE UNIVERSITY,
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# THE WILSON BULLETIN

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## EDITORIAL

WE WOULD LIKE to call attention to the very interesting discussion of faunal succession in Dr. Hicks' paper in this number of the BULLETIN. Let the reader also pause at the table showing the time afield and the distances covered. To cover 3,144 miles on foot in 2,733 hours is indicative of a fair degree of activity. The 2,733 hours represent about five months of solid time, but distributed throughout different seasons. This paper represents, therefore, intensive work in a very interesting region. Nevertheless, it is a faunal list, and we have a number of others awaiting publication; we may say in explanation that this paper appears at this time because of being subsidized.

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THE PRESS carried information in November that Rush Lake in northern South Dakota has become dry. In 1929 we visited this shallow lake and found breeding there a good sized colony of Western Grebes. We also found the nests of the Pied-billed Grebe, the Holboell's Grebe, and the Coot; the Eared Grebe was said to be there, though we did not happen to find a nest. Professor Kubichek was camped there at the same time; in fact, he has made this lake his headquarters during the breeding season for several years. This lake region was a paradise for many species, and Rush Lake seemed to be the favorite spot for many wild fowl. Within a mile or two is located Waubay Lake, where the Double-crested Cormorants breed, as described by Mr. Lundquist in a recent number of the BULLETIN. It is most fortunate that Professor Kubichek succeeded in getting some very remarkable motion pictures of the Western Grebe in various activities during the summers of his work at Rush Lake. It will be interesting to learn what becomes of this colony of Western Grebes if this lake does not fill up again before the next breeding season.

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*Science* for October 20, 1933, published an interesting note by Professor Francis Ramaley, of the University of Colorado, on the comparison of botanical papers of two selected decades, the first from 1886 to 1895, the second from 1923 to 1932. All papers were sorted under eleven classifications. Physiology "in all its branches" had 33 papers in the first decade and 176 in the second decade. Systematic botany including "morphology of the lower plants" had 176 papers in the first decade and 82 in the second. These figures show quite a definite trend. Now we hope that some one will make a similar study of some block of zoological literature.

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Mr. George Seth Guion (1716 American Bank Building, New Orleans, La.) desires to secure *original* copies of Numbers 1 and 3 of the WILSON BULLETIN (1894), and will pay a good price for them.

# GENERAL NOTES

**Conducted by M. H. Swenk**

**Second Occurrence of the Western Sandpiper in Iowa.**—A female Western Sandpiper (*Ereunetes maurii*) in juvenal plumage was collected by the writer on August 23, 1933. This bird was feeding alone in the shallow water of a cut-off creek bed near the Skunk River, ten miles northwest of Mitchelville, Polk County, Iowa. It was recognized as a Western Sandpiper before collecting it because of its long bill, thicker at the base. It appears to be a bird of the year, the skull being very thin and the plumage entirely unworn. The specimen is preserved in the writer's collection.

The only previous occurrence of this species in Iowa, substantiated by specimens, was on October 15, 1895, when Paul Bartsch secured two males and a female at Burlington, Des Moines County. These are now in the University of Iowa Museum.—PHILIP A. DUMONT, *Des Moines, Iowa.*

**Some Unusual Food Habits of the English Sparrow.**—While we were living in Richmond, Virginia, I occasionally noticed English Sparrows (*Passer domesticus*), usually females, busily eating the small leaflets of the mimosa tree in our front yard. Since we moved to Wilderness, I have seen two other rather unusual food habits of this bird. First, a short while ago, I saw two females of the species attempt to catch a hornet on the wing, as it was returning to its nest under the gabled roof of the porch. Another time, I saw a male vigorously shake something in his beak. Upon investigation, I found it was a large caterpillar, about three and a half inches long and more than an inch in circumference. It was very flat and contained but a small amount of green, mushy vegetable matter. There was not a break in the tough, leathery skin to account for the lack of body filler.—GORDON W. JONES, *Wilderness, Va.*

**The White Pelican on the Tennessee River.**—A record of the occurrence of the White Pelican (*Pelecanus erythrorhynchos*) on the Tennessee River in April, 1928, came to my notice several years ago. Some workmen on the highway bridge at Savannah, Tennessee, noticed a large dead bird floating in the river and secured it. A friend who witnessed the finding of the specimen saved a wing and the upper mandible as curios. These were later shown to me in Nashville. The mandible bore the horny elevation and checked with sizes quoted in the manuals.

The date of finding this bird was given as "about a week" after April 19, on which day an accident claimed a number of lives on the bridge. The pelican was said to have been shot, and to have been dead "a long time." Savannah lies about thirty river miles below the state line, above which point the Tennessee flows between the states of Alabama and Mississippi. The actual point of occurrence of this bird may have been in any of these states. Howell (*Birds of Alabama*, p. 39) gives several records for the Tennessee Valley.—HARRY C. MONK, *Nashville, Tenn.*

**First Record of the Golden-winged Warbler for South Dakota.**—On May 10, 1933, while on an early morning walk along the "Dells", about half a mile south of Dell Rapids, some warblers were noted feeding about thirty feet up in some ash and maple trees. After observing them for some time with bird glasses, it became evident they were not any of the migratory warblers that were familiar to me. In order to make their identification certain, I collected one

of the birds and found it to be a male Golden-winged Warbler (*Vermivora chrysoptera*). This is the first record of this bird for South Dakota. There appeared to be four birds of this species in the immediate vicinity, two males and two females. Identification was confirmed by Dr. T. C. Stephens. Mr. William Youngworth made the specimen into a skin, and this was donated to the collection of the State Museum at Vermilion.—Edwin C. Anderson, *Dell Rapids, S. Dak.*

**Analysis of Two Hundred Long-eared Owl Pellets.**—On February 19, 1933, I flushed three Long-eared Owls (*Asio wilsonianus*) from an evergreen in an old cemetery four miles northeast of Saline, Michigan. From beneath this tree I gathered up just 200 pellets, indicating that the birds had been roosting in this tree during much of the winter. The cemetery was a half mile from the nearest parcel of timber, a swampy piece of woods of some extent. Immediately adjacent to the cemetery on the east and south was plowed land; across the road to the west and north was pasture. I made the analysis of the pellets in the laboratories of the Museum of Zoology, at Ann Arbor, where I had the advice and assistance of Dr. Lee R. Dice and Dr. Josselyn Van Tyne. The results of the work were as follows: 170 *Microtus*, 21 *Peromyscus*, 3 *Synaptomys*, 4 *Blarina* and 1 English Sparrow (*Passer domesticus*). The preponderance of *Microtus* would indicate feeding in the open, although occasional forays into the nearby timber would yield *Peromyscus* in some numbers. *Synaptomys* is rare anywhere in Michigan, and while *Blarina* is not rare, the fact that it lives in burrows would explain its comparative absence from the bill of fare. Could a like number of pellets be obtained from this immediate vicinity in successive years, their examination should give indication of any fluctuation in small mammalian biota from year to year.—Chas. J. Spiker, *New Hampton, Iowa.*

**A Loon Found in the Highway.**—On the evening of April 14, 1931, while I was away from home, a neighbor, William Gabbard, and his brother-in-law, brought to my place a live Common Loon (*Gavia immer*) which the brother-in-law had discovered on a highway as he was driving along in his car. Later the same evening I saw Mr. Gabbard and he told me that his brother-in-law had taken the bird home with him but was going to bring it back in the morning. Early the next morning I went to see it. Loons must hate dogs for this one flounced towards Mr. Gabbard's dog each time it came near. The bird was chained, else it may have given the dog quite a battle. The extreme tip of its long, sharp, black bill was broken off; some one, teasing it, had allowed it to peck the sole of a shoe. Irregularly it gave vent to a long, drawn-out wail, and when placed in a small vessel of water it splashed and tried to dive, thoroughly enjoying, I would say, the opportunity to spend a few seconds in a bit of its natural element, though closely surrounded by unusual spectators.

I desired the freedom of the handsome bird, and before I left I was promised that it would be taken to some nearby body of water and released, but later I learned that this was not done immediately and it died in captivity a few days after I saw it.—Grant Henderson, *Greensburg, Ind.*

**Nesting of the Prairie Horned Lark in Central Virginia.**—For the past three or four years the presence of the Prairie Horned Lark (*Otocoris alpestris praticola*) during the summer in the vicinity of Lynchburg has led me to believe that it was nesting here. It is a fairly common winter visitor. On March 27, 1931, I saw a bird make two trips with nesting materials in the bill, and located the site that had apparently been selected for a nest. I did not return

to the spot until April 10, when there were three eggs in the nest. On April 13, two of the eggs had hatched and the young appeared to be about two days old. The third egg never hatched.

On April 19 another visit was made to the nest, when it was found that feathers were rapidly replacing the dirty tan down that covered the nestlings after hatching. This proved to be the last time that we saw the young birds. We took a Graflex to the nest on April 23, feeling sure that the young birds would still be there, but the nest was empty save for the sterile egg. There had been a severe storm on the preceding day, accompanid by unusually high winds, so it is probable that the young birds were destroyed. We took a photograph of the nest containing the single egg. Since this visit I have not even seen the adult birds, though I have visited the locality several times.

FIG. 17. Nest of the Prairie Horned Lark referred to in Professor Freer's note.

This seems to establish the southernmost record for the breeding of the Prairie Horned Lark on the Atlantic slope. Dr. J. J. Murray of Lexington, Va., says that he thinks the previous southernmost point was Fairfax, Va., about fifteen miles west of Washington, D. C., and about 150 miles northwest of Lynchburg, in a straight line.

Mr. H. H. Bailey, in his book, "Birds of Virginia", published in 1913, does not include the Prairie Horned Lark. He includes only breeding birds. Miss May Thacher Cooke in her paper, "Birds of the Washington, D. C., Region", states that this species is a "very rare summer resident" near Washington. Dr. H. C. Oberholser, in a letter to Dr. J. J. Murray, states that he believes this to be the southernmost record for the nesting of this species.—RUSKIN S. FREER, *Lynchburg, Va.*

**Upward Currents Not Required for Soaring Flight.**—Some recent papers in the WILSON BULLETIN have borne on the soaring flight and its mechanics, either advancing the theory that upward currents are necessary, or tacitly agreeing that this is so. I refer particularly to "Soaring of Raptorial Birds", by Palmer (March, 1931, pp. 18-24) and to Taber's "Curvature of Wing and Soaring Flight" (March, 1932, pp. 19-22). The subject is an old one, I know, and without the least desire of becoming controversial, in the interests of accuracy some further comments seem to be indicated.

Not having space for any lengthy discussion of methods, the time, or the place, I will make only one important statement. *My observations show that the Herring Gull (Larus a. smithsonianus) can soar (i. e., fly without flapping its wings) in a level current of air of twenty miles per hour velocity, and (a) remain practically motionless, (b) move forward, (c) move backward, (d) move on an upward incline, or (e) move on a downward incline.* It is fairly obvious that if one species can do this, another of the same relative wing and tail area and contour, and flight control, can do the same. Actually, I have seen the Eastern Red-tailed Hawk (*Buteo b. borealis*), Turkey Vulture (*Cathartes a. septentrionalis*), Southern Bald Eagle (*Haliaeetus l. leucocephalus*), Ring-billed Gull (*Larus delawarensis*), and Bonaparte's Gull (*Larus philadelphia*) in the same level soaring flight, under conditions that seemed to preclude any considerable upward movements of air currents.

The thoughtful paper of Brewster (*Auk*, January, 1912, pp. 85-92) discusses in a non-technical way this flight of the Herring Gull, while both Finley and Dawson, quoted by Bent (*Bull. 113, U. S. Nat. Mus.*, p. 130), have written similarly of the California Gull (*Larus californicus*), and Poole (*Auk*, April, 1925, pp. 209-216) seems to have observed various small birds in rising flight with set wings.

It therefore seems that the explanation of soaring flight must involve level air currents of some velocity, not entirely ascending air currents. That some species may take advantage of rising air streams, does not solve the problem, and only postpones the answer.—IVAN R. TOMKINS, *U. S. Dredge Morgan, Savannah, Ga.*

**More About the Blue-gray Gnatcatcher in Indiana.**—Some time ago an article of mine on the Blue-gray Gnatcatcher near this place was published in the WILSON BULLETIN, and there have been several comments about it. In the March, 1933, issue of the BULLETIN, Lyndon L. Hargrave of Flagstaff, Arizona, writes about the "Western Gnatcatcher Moves Its Nest". He says that he believes the bird sometimes moves the nest before the eggs are laid. In the case of the birds that we found, I may not have written all of the facts observed, but in this instance we first were attracted to the nest by hearing a commotion in the tree made by the parent birds when they were disturbed by a Hairy Woodpecker that was in the same tree. One parent bird made a terrible fuss as he or she arrived with a flying ant or winged insect in its mouth, so we knew that there were young near. As we watched, the bird went to the nest and fed the young. In that way we located it on the lower section of a forked branch with one fork beneath the other, the upper one being a sort of protection for the nest beneath it.

The next visit to the place showed the young out of the nest and flying about the tree, with the distracted parents following and rounding them up with protests and scoldings. We decided to return later for the nest, which we did,

but it had absolutely disappeared, and was not to be found after a close inspection of the ground beneath. This nest was finished when found, and a brood of three young birds, I think it was, were "finished off" for life and held their "coming out party" there. I add these few notes because Mr. Hargrave may have thought that the nest was not occupied, as in some cases that he had observed. I saw several gnatcatchers in the Mounds State Park that summer, but in 1932 could find no nests any place, although they may have nested there. These nests are not so easy to locate. That was the only one I have ever found. Perhaps the Hairy Woodpecker or ourselves made them move the nest, but if they did, it was after it had housed the family through one brooding season.—Mrs. Horace P. Cook, *Anderson, Ind.*

**Nesting of the Northern Raven in Virginia.**—The Northern Raven (*Corvus corax principalis*) was once found along all the higher mountain ranges of southwest Virginia, but is now almost a bird of the past with us, and the few that remain are confined to a small section of the Clinch Mountains and the area of the White Top Mountain and adjacent territory. Except in a general way there is not much to be found about the nesting habits of the raven in the various bird books. The best accounts are to be found in *Life Histories of North American Birds*, by Major Bendire (1895), but even those apply mostly to the West. However, most of the data given on the ravens of the West seem to be characteristic of the birds we have here, with a few exceptions. For the past few years I have made a special effort to get some nesting data on the ravens of this part of the state, and have been fortunate in finding a number of nests with both eggs and young. As there does not seem to be a published account of a raven's nest from this state, I will describe one which is typical of the majority that I have examined. Here they do not build on flat rock ledges, such as the Duck Hawk uses, but make the nest back in a pocket of a steep rock cliff, protected above with an over-hang.

On April 11, 1933, while hunting by myself for a nest of the raven on the north side of White Top, I saw a raven fly out from the cliffs, and in rounding a corner of the ledge that I was on, I could see the white-washed rocks and the nest about forty feet above me. I had some rope, but there was no way of reaching the nest from above on account of the wide over-hang, so I cut a spruce pole and climbed up to a crevice and pulled the pole up, finally reaching the nest in this manner. It was situated in a down-slanting pocket, too steep to stand on, and was nicely made of sticks, with a thick, smoothly finished lining composed of about equal parts of sheep's wool and Spanish moss, with a little buffalo hair. The exterior was twenty-four inches wide by eighteen inches deep, and the inside measured ten by five inches.

The four eggs which the nest contained were brought down in my binocular case, and on later examination they all proved to be decomposed, which was accounted for by seeing where some cat hunter had built a fire close to the nesting cliffs. The embryos were well formed in all of the eggs previous to their decomposition, so while no accurate nesting date can be given, the eggs must have been laid about the middle of March. They were smaller than the average eggs for this species, and were rather sharply pointed. They measured as follows: 1.94x1.24, 1.93x1.24, 1.86x1.23, and 1.83x1.23. For the hour that it took me to reach the ground after my examination of the nest none of the ravens were seen or heard, but while putting on my boots one of them alighted in a red spruce

close by, shortly followed by another. They made a considerable racket until I walked on, on a ledge in sight of them, when they both left in a hurry, occasionally diving sideways in the air, all the time voicing their protests. Flying in the direction of Cabin Ridge, they were seen no more.

Like the nests of the Duck Hawk, the rocks all around the ravens' nests are well white-washed, even when they are just building. They are very erratic in their nesting and two nests found while being built last summer were completed this season and occupied. Two nests with young, one found in April and the other in July, indicate irregular nesting dates. Whether all the eggs hatch or not as a usual thing is to be questioned, for three nests with young coming under my notice contained only two each. They are nearly always seen in pairs, except in late summer when the young of that season stay with the two old birds until nesting time the following year. The Crows fight them just the same as they do hawks, but the ravens seem to be able to hold their own very well and usually the Crows are the ones to leave the field of battle, sometimes minus a lot of feathers.—F. M. Jones, *Independence, Va.*

**Some Experiences with the Cerulean Warbler.**—A number of years ago, I first saw a Cerulean Warbler in May, as it was sitting on a brush pile in a woods pasture. From that time on, for perhaps ten or more years, I did not come across it at all. Then on May 12, 1933, at Mounds State Park, following a flood, I saw a flash of sky blue and the bird disappeared in the direction from which I soon heard a loud, repeated "*ze-ze-ze-ze-ze-ze-zé*". I was beneath the tree at the edge of the flooded area, and the bird was in the top. I tried to see him and finally saw the underparts of the singing bird—white throat, breast, belly, and undertail, with a dark narrow band resembling a string of beads across the breast, and black streaks bordering the sides—and I knew that the flash of blue and the black and white underparts belonged to the same bird. It was the first time I had heard the song. On June 21 following, I was in another woods about a mile to the north, when I heard the same song from two male birds at the same time during the heat of the hottest day of the summer, almost 96 degrees in the shade. At first I thought of the Blue-winged Warbler, but later I saw the birds as before with the white underparts with slightly black markings and the narrow black across the breast or throat. The two birds were answering each other, it seemed, each giving exactly the same song of seven notes and only rarely shortening the song to five or six notes. The Blue-winged Warbler gives but five notes as a rule, but his song sounds to me otherwise very much like that of the Cerulean. But the latter bird sits still very little, moving about the tree in a manner of the Red-eyed Vireo as he sings. Both birds were in the tops of tall trees, gleaning their food from the leaves and branches of the trees. They sang for long periods at a time, then rested awhile between songs.

The Blue-winged Warbler sits still in a low tree for long periods as he sings, and does not seem at all afraid. The Cerulean Warbler was too high to fear anyone. The male is much more beautiful to me than the books picture him. I understand that this bird has been in that woods for five years, but the authority is not an ornithologist and may be mistaken, although my bird experience is that they may return to the same places, as records of other species show. I expect to remember these haunts of this bird, hoping to eventually find his nest and to learn more about him.—Mrs. Horace P. Cook, *Anderson, Ind.*

**The American Egret and Other Herons Near Wichita, Kansas.**—On September 10, 1933, Dr. Claude C. Tucker observed three American Egrets (*Casmerodius alba egretta*) in the marshy flats of Kingman Lake. He reported also seeing several Sandhill Cranes (*Grus canadensis tabida*). Kingman Lake is situated eight miles west of Kingman, on thte Ne-Ne-Seah River. To the east of the lake is a high grassy hill. From here one can clearly see the entire lake. On September 16, 1933, the Audubon Society of Kansas took a field trip to this lake. From the hill all could clearly see the glistening snow-white egrets, half hidden by the tall marsh grass. During the afternoon they were repeatedly flushed. Their black legs and yellow bills, noted by us, established their identity beyond a doubt. On these same flats three Ward's Herons (*Ardea herodias wardi*) were seen, as well as several Black-crowned Night Herons (*Nycticorax nycticorax hoactli*). The Sandhill Cranes were also seen from the hill and carefully studied throughout the afternoon. Toward sundown, Mr. Charles Ruff and I made our way through the dense growth of weeds to the edge of the marsh. Here we startled four cranes. Their entire plumage was a slate gray, and as they took wing and flew across the mash we clearly noted their outstretched necks and feet.

On September 9, 1933, I visited Santa Fe Lake, sixteen miles east of Wichita. One end of the lake is overgrown with smartweed and is very marshy. While studying an American Bittern at the edge of the swamp, a large slate-blue bird flew up, uttering a familiar heron-like squawk as it took wing. Its head and neck were a dark reddish brown. This, together with its large size and black feet identified it as the Little Blue Heron (*Florida caerulea caerulea*). It settled on the farther side of a small patch of open water. At this place there was another Little Blue Heron. How many others, if any, were hidden in the weeds, I cannot say. Its smaller cousin, the Eastern Green Heron (*Butorides virescens virescens*), was also frequently seen.—Wilfred A. Goodman, *Clearwater, Kans.*

**The Mockingbird in Northeastern Illinois and Southeastern Michigan.**—On May 17, 1933, I was walking in the country just southwest of Chicago when I saw upon a telegraph wire a bird which I at first took for a Brown Thrasher. But careful examination at a distance of not more than a hundred feet indicated that it was a Mockingbird (*Mimus polyglottos*). I am certain of this identification, since I have seen many of these birds in the South, and I followed this one about, examining it several times. I never saw it again. About July 15, 1933, near Vicksburg, Kalamazoo County, Michigan, I identified another Mockingbird. In fact I examined it carefully on several successive days. It always remained in the same territory. It strikes me as rather an interesting coincidence that I should twice in the same season have seen a southern species of bird, even though the places in which they were seen were rather widely separated.—Cyril E. Abbott, *Morgan Park, Ill.*

**The Black Vulture in Dallas County, Iowa.**—An adult male Black Vulture (*Coragyps atratus atratus*) was secured by Mr. Louis S. Trevarthen three miles south of Perry, Iowa, on the Raccoon River, September 17, 1933. There was but the one lone bird, in a dead tree. The specimen was presented to the University of Iowa Museum. This is the first record of this species for Iowa.—Homer R. Dill, *University of Iowa Museum, Iowa City, Iowa.*

# ORNITHOLOGICAL LITERATURE

CHECK-LIST OF THE BIRDS OF MISSOURI. By Rudolf Bennitt. The University of Missouri Studies, VII, Number 3, July 1, 1932, pp. 1-81, one map. (Distributed September, 1933; reviewer's copy received September 18). Price, $1.25.

The reviewer recalls the pleasure with which, more than a quarter of a century ago when state bird lists were all much less ostentatious than many have been in more recent years, he first examined his copy of Mr. Otto Widmann's "A Preliminary Catalogue of the Birds of Missouri", published in the *Transactions of the Academy of Science of St. Louis*, XVII, pp. 1-288, in which the status of the 353 species and subspecies then known or believed to occur in that state was set forth, along with that of thirty additional forms of possible occurrence there, in a much more detailed and complete manner than was indicated by the adjective "preliminary" in the title. Mr. Widmann's excellent effort then seemed so comprehensive that it promised to be an adequate treatment of the subject for many years to come; but during the period intervening between then and now additional bird forms have been reported from Missouri and changes in the recorded status of the previously reported species have become necessary, while there has also been published an extensive revised classification of North American birds (*A. O. U. Check-List*, fourth edition, 1931), so that Mr. Widmann's list of 1907 has come no longer adequately to reflect the existing knowledge of the Missouri avifauna. This deficiency Dr. Bennitt, who is Associate Professor of Zoology in the University of Missouri, aims to supply in his new "Check-List", here under review.

In his "Check-List" Dr. Bennitt lists all of the 396 species and subspecies of birds now attributed to Missouri, and by means of letter symbols endeavors tersely to set forth the "general distribution, relative abundance and seasonal status" of each of these bird forms. He does not give the usual segregated "hypothetical list", but interpolates in brackets, in their proper systematic position in the main list of definitely admitted forms, fifty-seven additional forms "whose presence in the state is probable but not yet certain", with an indication of the basis for such hypothetical inclusion. There is a map (p. 10), a summary (pp. 67-71), a bibliography (pp. 72-75), and a good index (pp. 76-81).

Dr. Bennitt, we infer, does not intend that his "Check-List" shall be regarded as a highly critical review of the status of each form now or previously included in Missouri's bird list; at least it is not such. More it is a useful piece of ornithological record book-keeping. Published records, being such, seem to have been largely quite freely accepted at their face value, except of course in the cases of the more patent or egregious errors, when Dr. Bennitt quite properly disposes of them, usually in footnotes. To do otherwise than this of course involves an enormous amount of painstaking and time-consuming research. Experience in a number of states has indicated that in that final revision of its state list which every state should ultimately have, every individual record of every bird form must be challenged and thoroughly re-examined, and, unless the direct or clear circumstantial evidence reasonably demonstrates its validity and justifies its retention, should be eliminated. From a careful evaluation of the retained residue of records the general statement of the status of each form should be constructed. This is a tremendous task, of course, but some day it must be done for every

state. Meanwhile bird students should be and are grateful for the real help afforded them through the more superficially compiled state lists.

A common problem shared by every author of a state bird list is what to do with the "sight-records" of birds new to the list or so rare that only a few previous records exist. The reviewer does not stand with those who take the rather extreme position that, without exception, only such bird forms as have been collected, preserved, and authoritatively identified may validly be included in a state list, though admittedly this ultra-conservative course is the only wholly safe criterion that can be universally applied. But the reviewer does feel that in admitting such "sight-records" the very utmost of care and good judgment is necessary. As Dr. Bennitt states (p. 7), when "a sight-record is vouched for by an observer of known competence, dealing with a bird whose field marks are distinct and which was seen under favorable conditions, there is no good reason why it should not be accepted at face value." For examples, it is hard to see how there could be any reasonable doubt of the new "sight-records" of the Eastern Brown Pelican and the Man-o'-war Bird, under the circumstances described, to mention only the first two of such cases in Dr. Bennitt's "Check-List". But in a few cases one is compelled to question whether Dr. Bennitt has been quite conservative enough in the application of his rule. This is especially true in the accepted record of "three" American Hawk Owls allegedly seen by a "graduate student" of the University of Missouri in Howard County, northern Missouri, on January 3, 1932. Considering the great rarity of this species in states even farther north than Missouri this record is extremely questionable, and to those well experienced with many of even the most conscientious identifications of less experienced bird observers, the possibility of a misidentification of the Short-eared Owl immediately suggests itself.

In a number of instances a lack of adequate material and field work in parts of Missouri and (or) a lack of sufficiently careful identifications of closely related bird forms seems evident in the conclusions regarding the relative abundance of forms reached by Dr. Bennitt in the new "Check-List". To the present reviewer, familiar for the past thirty or more years with the birds of southeastern Nebraska, just across the Missouri River from northwestern Missouri or only a few miles removed, it is difficult to regard such birds as the Western Sandpiper, Arkansas Kingbird, or Shufeldt's Junco as "casual" in the sister state, or the Stilt Sandpiper, Red-shafted Flicker, Gambel's Sparrow, or Dakota Song Sparrow as "rare" there, or the Eared Grebe and Thick-billed Red-wing as even "uncommon" there, during migrations, to mention just a few of the cases. The lack above mentioned probably causes Dr. Bennitt to record, for example, the Lesser Loon as a "casual" addition to the Missouri list, on the basis of two specimens identified, while all previous records are referred to the Common Loon, which is given as an "uncommon transient visitant throughout the state", interpreting Dr. Bennitt's symbols, thus giving the impression that in Missouri the larger form is much more common than the smaller one, a highly improbable status in view of the determined relative abundance of the two forms in Nebraska (see *Nebraska Bird Review*, I, p. 89). Again, the Bendire's Crossbill, which Dr. Bennitt includes only hypothetically in his list, is the form to which many, probably most, of the red crossbills wintering in southeastern Nebraska, and undoubtedly also northwestern Missouri, belong.

But if Dr. Bennitt did not have adequate material and time to reach conclusions that bid fair to remain reasonably permanent on the status of a number of Missouri birds, he is still to be thanked and congratulated upon the generally excellent results that he obtained with the data and opportunities available to him. The new Missouri "Check-List" is a very helpful piece of work, and should be available to every serious bird student in Missouri and surrounding states. Widmann's basic 1907 list, with the transitional new "Check-List" of Dr. Bennitt's, form a very good basis for the encouragement of such additional accurate field and museum studies on Missouri birds as will pave the way for that more critical, complete, and semi-final exposition of the avifauna of that state which Dr. Bennitt at some later time or some other worker will present to interior ornithology in the future.—M. H. S.

A Revised List of the Birds of Iowa. By Philip A. DuMont. University of Iowa Studies in Natural History, Vol XV, No. 5, pp. 1-171. Iowa City, 1933. Price, $1.00. (Order from the Department of Publications, Iowa City).

This paper is a revised list of the birds of the state. It deals with the status of the birds in as condensed a manner as feasible. Thus, the author has omitted all "popular" matter and illustrations (though a rather inadequate map of Iowa is included). The status of the Chimney Swift is presented in one concise sentence, "A common summer resident, breeds in all parts of the state." But the author enters into detail in order to straighten out more perplexing cases, and in the case of the chickadees he uses two pages. In general the amount of discussion varies inversely as to the rarity or confusion of the forms.

In comparison with the previous list by R. M. Anderson, published in 1907, the DuMont list records 364 forms while Anderson listed 354. The present author deletes a number of Anderson's birds and includes thirty-five not previously included.

The list is a splendid and, in most cases, a careful summation of the birds of Iowa, and the author is to be congratulated upon his results. Mr. DuMont is a capable ornithologist and has critically examined the available material. He has thus revised many of the subspecific standings formerly confused. Our pleasure is marred somewhat when we discover a few subspecific identifications without specimens. The subspecies of ravens and paroquets have been determined through neither has occurred in Iowa in years nor have any specimens been preserved! The author has followed the A. O. U. Check-List, but this is not a proper scientific method. We firmly believe that *no subspecific determination should ever be made except upon critical examination of adequate specimens.*

The author says, "It is a generally accepted rule among ornithologists that no species of bird be admitted to a state list unless a specimen has been captured within the state and preserved or examined by a competent bird student." Using this as a criterion, we find that the following appear to be included in the list without the collecting *and preservation* of a specimen. We believe that they should be considered as hypothetical until such time as evidence fulfilling the author's rule be obtained:

Western Grebe, *Aechmophorus occidentalis.*
Water Turkey, *Anhinga anhinga.*
Snowy Egret, *Egretta thula thula.*
Wood Ibis, *Mycteria americana.*

Cinnamon Teal, *Querquedula cyanoptera.*
American Scoter, *Oidemia americana.*
Harris's Hawk, *Parabuteo unicinctus harrisi.*
Black Rail, *Creciscus jamaicensis stoddardi.*
Hudsonian Curlew, *Phaeopus hudsonicus.*
Black-necked Stilt, *Himantopus mexicanus.*
Louisiana Paroquet, *Conuropsis carolinensis ludovicianus.*
Great Gray Owl, *Scotiaptex nebulosa nebulosa.*
Nuttall's Poor-will, *Phalaenoptilus nuttalli nuttalli.*
Lewis's Woodpecker, *Asyndesmus lewis.*
Arctic Three-toed Woodpecker, *Picoides arcticus.*
Say's Phoebe, *Sayornis saya saya.*
American Raven, *Corvus corax sinuatus.*
Common Rock Wren, *Salpinctus obsoletus obsoletus.*
Eastern Mockingbird, *Mimus polyglottos polyglottos.*
Northern Prairie Warbler, *Dendroica discolor discolor.*
Western Blue Grosbeak, *Guiraca caerulea interfusa.*
Lazuli Bunting, *Passerina amoena.*
Gray-crowned Rosy Finch, *Leucosticte tephrocotis tephrocotis.*
McCown's Longspur, *Rhyncophanes mccowni.*

It would also seem that the Red-throated Loon, *Gavia stellata;* Man-o'-war Bird, *Fregata magnificens;* and the Chestnut-collared Longspur, *Calcarius ornatus,* should be checked up before being definitely given a place in the list.

We hope that pointing out these doubtful birds will stimulate the Iowa bird students to obtain the proper evidence before another season passes. As the state list now stands, 337 species may be definitely assigned to Iowa.—L. W. W.

Editor's Note.—The reader will hardly fail to note the conflicting points of view concerning sight records in the two preceding reviews. There is probably no way of escaping this clash of opinion, not only among reviewers, but among ornithologists in general. On the one hand there is demanded as a basis for belief the capture and preservation (for verification) of a specimen. Verification is one of the corner-stones of science. Too often we are satisfied with merely the report of a captured specimen, and forget to verify the identification. Mr. DuMont's painstaking examination of all known existing specimens of the rarer Iowa species has revealed a number of erroneous identifications with the bird in hand. The truth is not established, therefore, by the mere possession of the specimen. One person's identification of a species in hand may not be as trustworthy as another's identification at a distance of fifty yards. As we have previously claimed, the personal equation is a very strong factor in the problem of credibility. Yet, in all cases science demands the right of verification; and without this a specimen in hand is no better than a sight record. Examples of the failure of the specimen criterion for admissibility will be found in the Appendix of DuMont's list.

On the other hand, let us consider the case of Lewis's Woodpecker in northwestern Iowa during the winter of 1928-29. This single bird was under observation for hours at a time by various observers at different times from November to March. Since there are no complicating subspecies in this case the problem of identification is a simple one. To those who experienced the demonstration

there is no possibility of doubt that this species occurred within the geographical boundaries of Iowa. The only problem is to convince the astute scientist, who is by nature and profession a skeptic. And this will depend upon the credibility of our testimony. Yet, whether the doubter is convinced and believes does not alter the fact. The requirement of a specimen may be safe as a general and arbitrary criterion, but it may fail and fall short of the truth in a great many cases. Much the same discussion might be offered relative to the mockingbird as an inhabitant of Iowa, for it has been repeatedly observed by competent students. The question of subspecies may be raised in this case, however, though *probability* would favor the decision made by the author.

If we are to attempt to generalize on this discussion, it will be to the effect that species can be identified in the field, while subspecies can not be; that sight records on species are admissible in proportion to the credibility of the witness (just as are laboratory determinations, except that verification is possible in the latter), while sight records of subspecies should be wholly inadmissible.—T. C. S.

Autobiography of a Bird-Lover. By Frank M. Chapman. D. Appleton-Century Co., New York. 1933. Pp. 1-420, 87 figures. Price, $3.75.

The reading of this book has been a pleasure. The reading of biography is usually interesting. Biography of ornithologists is especially interesting to us. The present biography is of one of America's foremost contemporary ornithologists, one who is acknowledged as a great leader in popularizing bird study in this country. Dr. Chapman must have been a "born" ornithologist; nevertheless he had a narrow escape from the drudgery of another profession. The book treats quite fully of Chapman's work in tropical America, where he was concerned chiefly with faunal phylogeny. While he has contributed his share to systematic ornithology, yet we gather the impression from his autobiography that he has derived the greatest pleasure from his work as a field ornithologist—distributional studies, etc. On page 209 the following interesting statement is made: ". . . the work of the collector in securing specimens must be supplemented by that of the systematist in identifying them. I have found that in 'working up' a collection representing a fauna with which I am fairly familiar, I average about a species a day." No snap judgment here, evidently! A bibliography of Dr. Chapman's writings and an index conclude the book.—T. C. S.

Traveling with the Birds. A Book on Bird Migration. By Rudyerd Boulton. Illustrations by Walter Alois Weber. M. A. Donohue and Company, Chicago, Ill. 1933. Pp. 1-64. Colored pls. I-XII. Price, $1.50.

Mr. Boulton here presents an excellent discussion of bird migration for younger readers. Any young person who is interested in birds will find pleasure and instruction in the text. And, indeed, the adult reader, if not already acquainted with the facts, will be able to read with interest. Not less important are the twelve colored plates, depicting twenty-four species of typical migrants, by Mr. Weber. A book of this kind will make a splendid gift, and will be valued much beyond the very reasonable cost. We are repeatedly astonished at the volume of choice literature now available to students of nature, and especially relating to birds. This book may be expected to make its contribution to ornithology by informing and inspiring the youth.—T. C. S.

Birds of the Atlanta, Georgia, Area. By Earle R. Greene. Bull. No. 2, Georgia Soc. Naturalists. Pp. 1-46. 1933. Published by the Society. Price, $1.00 (P. W. Fattig, Curator-Librarian, Emory University, Ga.).

This list comprises 208 kinds of birds which have been found by the author within the area treated. No comprehensive report has been issued on the birds of this state; consequently such local lists as this one will be useful, not only to present local students but also, doubtless, at some time when a state-wide report is contemplated. In addition to the author's list an appendix includes annotations on twenty-four other species which have been observed by other students. The proof-reading seems to have been carefully done, and the mechanical work is good. There is no index, but it is not especially needed in this case. A bibliography would have been of service, however.—T. C. S.

History of the Present Status of the Breeding Colonies of the White Pelican in the United States. By Ben H. Thompson. Occasional Paper No. 1, Wild Life Division, U. S. Nat. Park Service (213 Hilgard Hall, Berkeley, Calif.), pp. 1-85.

This excellent summary gives an account of the present known distribution of the White Pelican during the breeding season, based upon a very complete review of recent literature. The question of the relationship between the White Pelican and fish is examined. Several reasons are given why the pelican should not be outlawed because of his fish-eating habits. While a colony of pelicans consumes great quantities of fish, yet it is a fact of observation that under wild conditions the great bulk of such food consists of non-game fish. In only one or two instances are pelican colonies located near enough to artificial fish rearing ponds to be a menace. One of these is probably the famous Yellowstone Park colony, near which man has chosen to locate a fish hatchery. Furthermore, it seems to be evident that pelicans consume only the excess fish population—that nature has adjusted the problem by over-production of fish; that were the pelican check removed the surplus of fish might be self-destructive. The census shows that the White Pelican now breeds in seven important colonies in North America (about twenty-six large and small colonies are listed), with an estimated population of about 30,000 individuals. An excellent bibliography is included.—T.C.S.

The Microscopic Anatomy of the Digestive Tract of Gallus domesticus. By M. Lois Calhoun. Ia. State Coll. Journ. Sci., VII, No. 3, 1933, pp. 261-382, pls. I-XXXIX.

This paper gives a very complete review of the literature of the subject, the great bulk of which seems to be in the German language. The very extensive bibliography together with the review of literature will be a welcome aid to American anatomists. The author examined microscopically all portions of the digestive tract of the domestic chick at various ages after hatching. Descriptions and micro-photographs show the results.—T. C. S.

The Audubon Year Book (Indiana) 1933. Published by the Indiana Audubon Society. Pp. 1-108. Numerous figures. Price, $1.00 (Address Miss Margaret R. Knox, 4030 Park Ave., Indianapolis).

Dr. Earl Brooks gives a history of the numerous names for the Robin, but the article contains a great many typographical errors. Mr. Perkins presents a report on returns of Bronzed Grackles banded in Indiana, showing migratory

movements. Another article by Dr. Test gives results of banding Mourning Doves in Indiana. Still another article on banded Song Sparrows is by S. W. Witmer. W. L. McAtee has a list of Indiana trees and shrubs which bear food for birds. And there are other interesting papers.—T. C. S.

Cave Life of Kentucky, Mainly in the Mammoth Cave Region. By Vernon Bailey. Published by the University Press, Notre Dame, Ind. 1933. Pp. 1-256. Price, $1.25.

This book deals interestingly with the animal life of the Mammoth Cave and vicinity. The mammals, fishes, reptiles, and amphibians are described by Mr. Bailey. The chapter on birds is by Mrs. Florence Merriam Bailey. The invertebrates are treated by Leonard Giovannoli. Since there are no birds which actually inhabit the caves, the birds treated are those which live in the region surrounding the caves. The book is intended to be a help to the tourist who visits this region. Mrs. Bailey has drawn on the current ornithological literature to secure interesting new facts concerning the species of which she writes. Approximately half of the book is devoted to the bird life. Ample descriptions are given of the other vertebrates, but they are less numerous than the birds. The invertebrates are considered, but much less completely. An index and a very full bibliography are furnished. We have noted elsewhere in the reviews reference to a publication entitled "Caverns of Virginia" ($1.00) issued by the Virginia Geological Survey. Another newly described cave is known as Longhorn Cave, located twelve miles south of the town of Burnet, Texas. The region including this cavern has recently been set aside as a state park. The cavern is described geologically and mapped in the April, 1933, number of *Field and Laboratory* (Vol. I, No. 2, Southern Methodist University, Dallas, Texas).—T. C. S.

Suggestions for Pheasant Management in Southern Michigan. By Howard M. Wight. Published by the Department of Conservation, Lansing, Mich. 1933. Pp. 1-25.

Much information about the habits of this bird is presented herein, as well as suggestion on management.—T. C. S.

Bulletin of the Essex County Ornithological Club of Massachusetts. Salem, 1932. Pp. 1-54. Price, 50 cents. (S. Gilbert Emilio, Treasurer, 7 Winter St., Salem, Mass.).

Mr. Griscom presents an interesting comparison of the Western and Yellow-bellied Flycatchers, stimulated by a late fall record of a specimen taken in Massachusetts. Dr. C. W. Townsend records the birds seen on four trans-Atlantic trips. A composite local list for 1933 is reported by S. G. Emilio. There are also other short papers.—T. C. S.

More Game Birds by Controlling Their Natural Enemies. Published by More Game Birds in America, A Foundation, 500 Fifth Ave., New York, N. Y. Pp. 1-62. 1933.

We find here a popular manual on "Vermin". Under this heading are classified seven owls, nine hawks, and five other birds; also about thirteen mammals, various snakes and turtles. Control in various degrees is recommended for these predators, and methods of control are explained. Much information is given, and we have looked carefully for misinformation without positive success. For instance, it is said that the Sparrow Hawk "will take small birds". This is true

according to most authorities, but whether this hawk will take them in sufficient numbers to justify control by the "gun and pole trap" is another matter. We intend to make no quarrel with these people who wish to control "vermin", for we realize that our viewpoint may be just as prejudiced as we think theirs is. But we think they are actuated by selfish motives in desiring to preserve only game for hunting. However, an argument is useless.—T. C. S.

A List of Vermont Birds. By H. C. Fortner, Wendell P. Smith, and E. J. Dole. Bull. No. 41, State Dept. Agric. (Probably obtainable at the State Capital).

The list includes a statement on the status of each species. A second, shortened, list gives descriptions.—T. C. S.

A Decade of Bird Banding in America. A Review. By Frederick C. Lincoln. Smithsonian Report for 1932, pp. 327-261. Washington, 1933.

As suggested by the title this paper is a review of the scientific results of bird banding during the past ten years. Three maps and seven halftones illustrate phases of the work.—T. C. S.

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We have received copies of the *Florida Naturalist* for January and October, 1933. The earlier number contains an article by Mary Frances Baker on "June on the Florida Keys", and one by Lucien Harris, Jr., "A Trip to the Brevard Reserve". Articles in the October number report on the newly organized state conservation department, and on a collecting trip into Florida by biology students from Hanover College.

The National Association of Audubon Societies has issued a leaflet entitled "The Problem of the Vagrant Cat", by T. Gilbert Pearson. (Circular No. 18, pp. 1-4, Nat. Ass'n Aud. Soc., 1775 Broadway, N. Y.). It reprints the cat licensing ordinance proposed by the International Cat Society, and also offers a control method free from the license idea. Our readers are familiar with the license plan, which is practically the same as for dogs. The new plan recommended, and for which a model ordinance is presented, provides that no cat be allowed to run at large unless it bears an identifying tag, tags to be furnished at cost (about five cents) by the town clerk. Cats found at large without identifying tags may be impounded for forty-eight hours, and if not claimed are to be humanely killed. Many people, the vast majority, little realize what a nuisance the domestic cat has become in this country. The new plan seems to be workable, and is free from certain objections to the license plan.

Crevecoeur's Notes on Birds in Pottawatami County, Kansas, by Arthur L. Goodrich, in Trans. Kans. Acad. Sci., XXXV, 1932, pp. 85-92, in one table shows the earliest and latest arrival dates for many common birds. A second table shows the time in minutes before and after sunrise when birds begin to sing, and figures are given for nearly fifty species.

The Proceedings of the South Dakota Academy of Science (Vol. XIII, 1929-1930) contains a brief sketch by W. H. Over of Gabriel Smith Agersborg, together with a re-publication of Agersborg's list of "The Birds of Southeastern Dakota", which was originally published in the *Auk*, Vol. II, 1885.

The Journal of the Tennessee Academy of Science (Vol. VII, No. 4, October, 1932) contains a list of "The Water Birds of Radnor Lake" (which is close to Nashville) by Harry C. Monk.

*News from the Bird Banders for August* (VIII. No. 3, August, 1933) contains a leading article on "Cooperative Ornithology" which is a summarized review of the major coöperative undertakings in the development of ornithological knowledge. Like a previous one on "Territory" this one is a valuable review of recent work and literature.

*Inland Bird Banding News* for March (V, No. 1) contains a report by Dr. Louis A. and Frederick H. Test on recent banding work in Indiana, giving the special problems worked on by the banders in that state. Miss Arch Cochran discusses (V, No. 2, June) the construction and use of nets in trapping birds. Mr. M. J. Magee gives an interesting account of the White-throated Sparrow. In the September number (V, No. 3) Mr. W. I. Lyon makes a full report of his annual banding trip to the islands in Lake Michigan, showing a total of 4,644 banded birds and something over 3,000 miles travelled by automobile and boat. Full directions are given for building the circular water trap.

The following mimeographed publications have been received in recent months:

The *Raven*, Bulletin of the Virginia Society of Ornithology, is edited and published at Lynchburg, Virginia, by Dr. J. J. Murray.

The *Saint Louis Bird Club Bulletin* is published monthly (except in July, August, September) at $1.00 per year. Address Mrs. Elizabeth Allen Satterthwait, 118 Waverly Place, Webster Groves, Mo.

The *Chickadee* is published by the Forbush Bird Club, 12 State St., Worcester, Mass. The September number gives a list of wild fruits and artificial foods and the birds known to feed on each kind.

The *Snowy Egret*, which we have not seen for some time, comes now as the Summer Number (Vol. VIII, No. 1). It is published by H. A. Olsen and R. E. Olsen, 172 Manchester St., Battle Creek, Michigan, and is issued irregularly.

The *Flicker* is published quarterly by the Minnesota Bird Club, at $1.00 per year, and may be ordered through the Secretary-Treasurer, Marius Morse, 4031 Fortieth Ave., Robbinsdale, Minn. The number for October, 1933, contains a beautiful tribute to a deceased member, Donald Fischer. A list of breeding birds in Minnesota during the season of 1933 includes 133 species, with the nests observed for 120 species. The mimeograph work is worthy of note—the type is large and the printing is clear.

The *Cornell Rural School Leaflet* is a quarterly magazine dealing with the facts of natural history, and perhaps occasionally with general science. It presents the material in a form intended to be especially helpful to teachers in the schools below the college. Heretofore this publication has not been available to teachers in the city schools of New York, nor to any outside of that state. Now, anyone in the United States may subscribe beginning with Volume XXVII (September, 1933) at fifty cents for the four annual numbers. The number of pages in each number is variable, but the smallest number in the last year or two has been 32, while the maximum number has been 124. The material in this series will be very helpful to nature study teachers, and, doubtless, many will be glad to learn that it is to be made available to everyone.

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The Club values the continued support of every member, and every resignation is received with regret.

The reports of the officers will be published as usual in the March number, but there will not be the usual "Proceedings". We are closing the year with a sufficient balance to cover the cost of printing the December issue of the BULLETIN, the preceding four issues having been paid for out of the income of the 1933 fiscal year. The coming year will still be an uncertain one financially, and if we know early in the year what our income is to be we may be able to enlarge the BULLETIN accordingly. Therefore, we hope that those who can will remit dues promptly.

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In behalf of the Officers of the Club the WILSON BULLETIN extends the greetings of the season to all of its readers, and wishes for everyone a realization of promised prosperity.